OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

FIELD SAMPLING AND QUALITY ASSURANCE PLAN FOR THE REMEDIATION OF LANDFILL SITES 1, 3, 5, 6, AND 8 NAVAL AIR STATION BRUNSWICK, MAINE

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Northern Division
Naval Facilities Engineering Command
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1.0 INTRODUCTION

This Field Sampling and Quality Assurance Plan (FSQAP) has been generated to guide the field sampling and laboratory chemical analysis of soils, and engineering testing of construction materials associated with remediation of the landfills at Sites 1, 3, 5, 6, and 8 at the Naval Air Station, Brunswick, Maine (BNAS).

The proposed OHM project team members are experienced in providing sampling services using NEESA recommended protocols. All technical support for the project will be supplied by OHM Corporation's Eastern Region, located in Trenton, New Jersey and Hopkinton, Massachusetts.

2.0 PROJECT DESCRIPTION

This Project encompasses the excavation of soils contaminated by both organic and inorganic compounds, including asbestos, the filling and backfilling of the excavated areas and the extension of monitoring wells. Analytes of concern for this Project include:

- Target Compound List (TCL) Volatile Organic Compounds (VOCs)
- TCL Semivolatile Organic Compounds (SVOCs)
- TCL Pesticides/Polychlorinated Biphenyls (PCBs)
- Target Analyte List (TAL) Inorganics
- Asbestos

2.1 SITE

The Site 1 landfill was used from 1955 to 1975 and the general area covers more than 60 acres, although the specific area of documented refuse disposal is much smaller, approximately 8.5 acres. Material reportedly disposed of in this landfill included garbage, food waste, refuse, waste oil solvents, pesticides, petroleum products, paint wastes, aircraft and automobile parts, and various chemicals. Refer to Figure 2-1 for the location map for Sites 1, 3, 5, 6, and 8.

The Site 3 landfill was used from 1960 to 1973 and the general area covers approximately 1.5 acres. Wastes disposed of at this site included solvents, paints, and isopropyl alcohol. No waste material has been observed at Site 3 and only low-level soil contamination was reported. Although Site 3 was originally believed to be a separate disposal site from Site 1, field sampling activities did not show a clear delineation between the two sites. Refer to Figure 2-2 for a drawing showing the Sites 1 and 3 work zones.

Site 5 was used to dispose of asbestos-lined pipe from a building that was demolished on base. The site was inspected in 1980 by a facility engineer who described the site as consisting of two trenches filled with the asbestos material and covered with soil. Refer to Figure 2-3 for a drawing showing the Site 5 work zones.

Site 6 was reportedly used for general dumping of construction debris and other nonputrescible wastes. Aircraft parts and asbestos-containing pipes were reportedly burned here. Concrete, asphalt, pipes, and other debris are visible at the surface. Refer to Figure 2-4 for a drawing showing the Site 6 work zones.

Site 8 was a disposal area for rubble, debris, and trash from the base. In addition, industrial solvents may have been disposed here. Refer to Figure 2-5 for a drawing showing the Site 8 work zones.

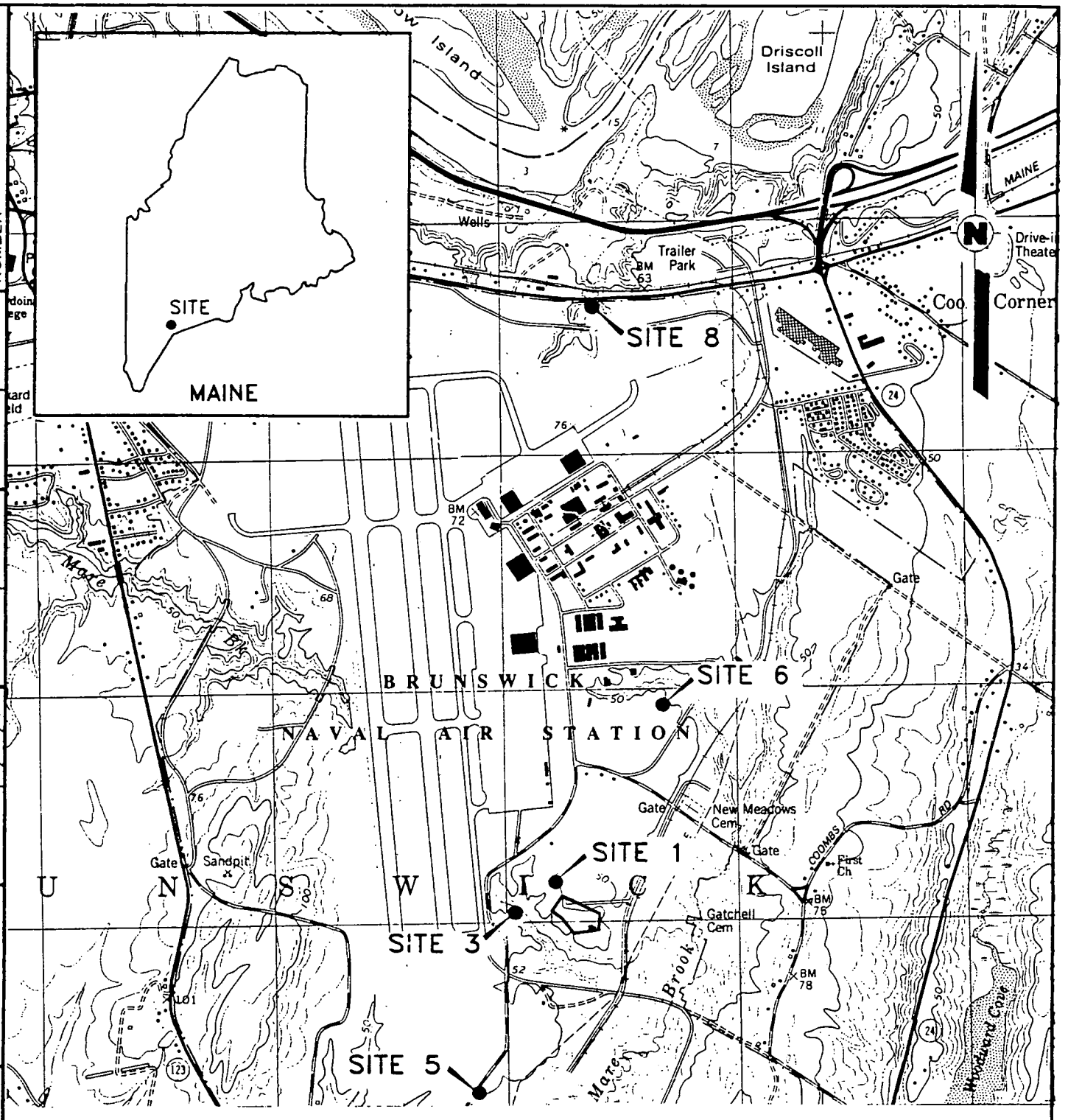
2.2 OBJECTIVES

The objectives to be met for the remediation of Sites 1, 3, 5, 6, and 8 include:

- Site preparation, including clearing and grubbing the five landfill sites and the facility areas and relocating utilities around the Landfill Sites 1 and 3

- Removal of wastes from separate Sites 5, 6, and 8 and placing it in Landfill Sites 1 and 3

- Backfill and regrade Sites 5, 6, and 8
- Installation of slurry wall around Sites 1 and 3
- Filling with clean fill to develop the landfill design grade at Landfill Sites 1 and 3
- Construct a geosynthetic-lined detention basin to accept drainage from the landfill
- Installation of gas venting system at Landfill Sites 1 and 3
- Installation of a layered geosynthetic and soil cap at Landfill Sites 1 and 3
- Revegetation and site restoration of all disturbed areas at the five sites.



SCALE

0 2000 4000 feet

FIGURE 2-1

LOCATION MAP FOR SITES

REMEDIATION OF SITES 1, 3, 5, 6, AND 8
NAVAL AIR STATION, BRUNSWICK, MAINE

PREPARED FOR

DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PENNSYLVANIA

OHM Remediation Services Corp.

REFERENCE:

1. BASE MAP PREPARED FROM 7.5 MIN U.S.G.S. TOPOGRAPHIC MAP OF BRUNSWICK, MAINE QUADRANGLE, DATED: 1980, SCALE: 1:24000.
2. LOCATION OF SITES 1, 3, 5, 6, 8, OBTAINED FROM SHEET C2 PREPARED BY ABB - ENVIRONMENTAL SERVICES, INC.

DRAWING NUMBER 16285-A4
APPROVED BY
CHECKED BY
DRAWN BY M. WARNICK 1/31/95
OHM CORPORATION PITTSBURGH, PA
X-REF
PLOT SCALE: 1" = 1'

DRAWING NUMBER 16285-B1

APPROVED BY

CHECKED BY

DRAWN BY M. WARNICK 2/15/95

OHM CORPORATION PITTSBURGH, PA

X-REF TOPO-4

PLOT SCALE: 1" = 1'

20' CLEAR ZONE OUTSIDE FENCE (TYP.)

30' CLEAR ZONE WITHIN FENCE (TYP.)

ORION STREET

PROVIDE NEW 4" WATER LINE (TYP.)

LAYDOWN AND STORAGE AREA

NEW SLURRY WALL

20' CLEAR ZONE EACH SIDE OF RELOCATED 45' CLASS 5 POLES (TYP.) UTILITIES ON THESE POLES ARE TELEPHONE LINE, 200 PR; 3ø-4W, 4160V; CTV-1-COAX; SEC-25 PR, #18.

MERRICONEAG ROAD (RT.)

CONTAMINATION REDUCTION ZONE

ASBESTOS MATERIAL DIPOSAL AREA

TEMPORARY SOIL STOCKPILE FOR SLURRY WALL REMOTE MIXING

PERIMETER ROADWAY (GRAVEL)

EXCLUSION ZONE (SEE NOTE 1)

EXCAVATED DEBRIS AND CONTAMINATED SOIL STOCKPILE AREA

CONSTRUCTION BASELINE (TYP.)

REMOVE GUARD RAIL

TEMPORARY SOIL STOCKPILE FOR SLURRY WALL REMOTE MIXING

PROVIDE NEW 4" WATER LINE (TYP.)

PROVIDE NEW 4" CONDUIT FOR TELEPHONE (TYP.)

REMOVE GUARD RAIL SEE NOTE DWG. C-11

NEW SLURRY WALL

PROVIDE 5FT. HIGH CONSTRUCTION FENCE, 7' FT. (MIN.) FROM EXISTING SECURITY FENCE.

EXTEND CONDUIT UP POLE 20 FT.

NEW SLURRY WALL

BLDG. NO. 643

BUILDING NO. 642

BUNKERS

BUILDING NO. 539

EXISTING SEPTIC TANK

12" CULVERT S=1.0%

ABANDONED SEEPAGE BED

12" CULVERT S=1.0%

EXISTING LEACHFIELD

HARDHOOD CREEK WAY

MERC BROOK

SCALE

0 150 300 FEET

REFERENCE:

DRAWING PREPARED FROM SHEETS C-6 AND C-7 PREPARED BY ABB ENVIRONMENTAL SERVICES.

LEGEND:

- APPROXIMATE LOCATION EXISTING LANDFILL TRENCH (PER 1969 NASB PLAN)
- APPROXIMATE LIMITS OF WASTE
- NEW SLURRY WALL, 3 FT. WIDE
- UTILITY POLE TO BE REMOVED
- UTILITY POLE TO BE RELOCATED
- RELOCATED UTILITY POLE LOCATION
- CONTAMINATION REDUCTION ZONE
- EXCLUSION ZONE
- TEMPORARY SOIL STOCKPILE FOR SLURRY WALL REMOTE MIXING

NOTE:

1. EXCLUSION ZONES WILL RECEIVE COVER AND BE CLOSED DAILY. THESE AREAS WILL BE OPENED, EXPANDED AND CLOSED AS NECESSARY FOR THE SITE OPERATION. ACTIVE AREAS WILL BE ENCLOSED WITH ORANGE FENCE.

FIGURE 2-2

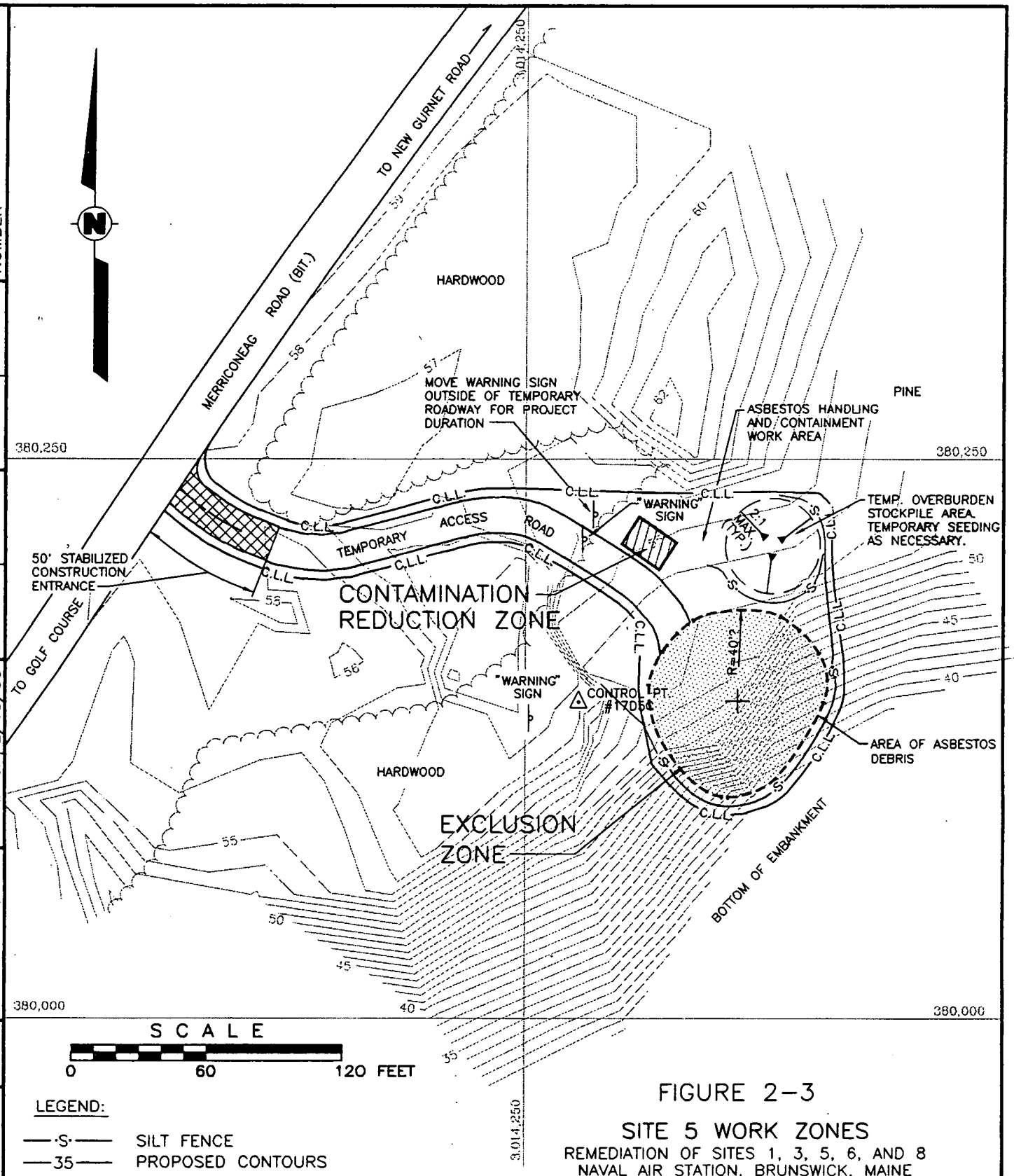
SITES 1 AND 3 WORK ZONES

REMEDIATION OF SITES 1, 3, 5, 6, AND 8
NAVAL AIR STATION, BRUNSWICK, MAINE

PREPARED FOR

DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PENNSYLVANIA

OHM Remediation Services Corp.



LEGEND:

- —·S·— SILT FENCE
- —35— PROPOSED CONTOURS
- EXCLUSION ZONE
- CONTAMINATION REDUCTION ZONE

REFERENCE:

1. DRAWING PREPARED FROM SHEET C-21 PREPARED BY ABB ENVIRONMENTAL SERVICES

FIGURE 2-3

SITE 5 WORK ZONES

REMEDIATION OF SITES 1, 3, 5, 6, AND 8
NAVAL AIR STATION, BRUNSWICK, MAINE

PREPARED FOR

DEPARTMENT OF THE NAVY
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NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PENNSYLVANIA

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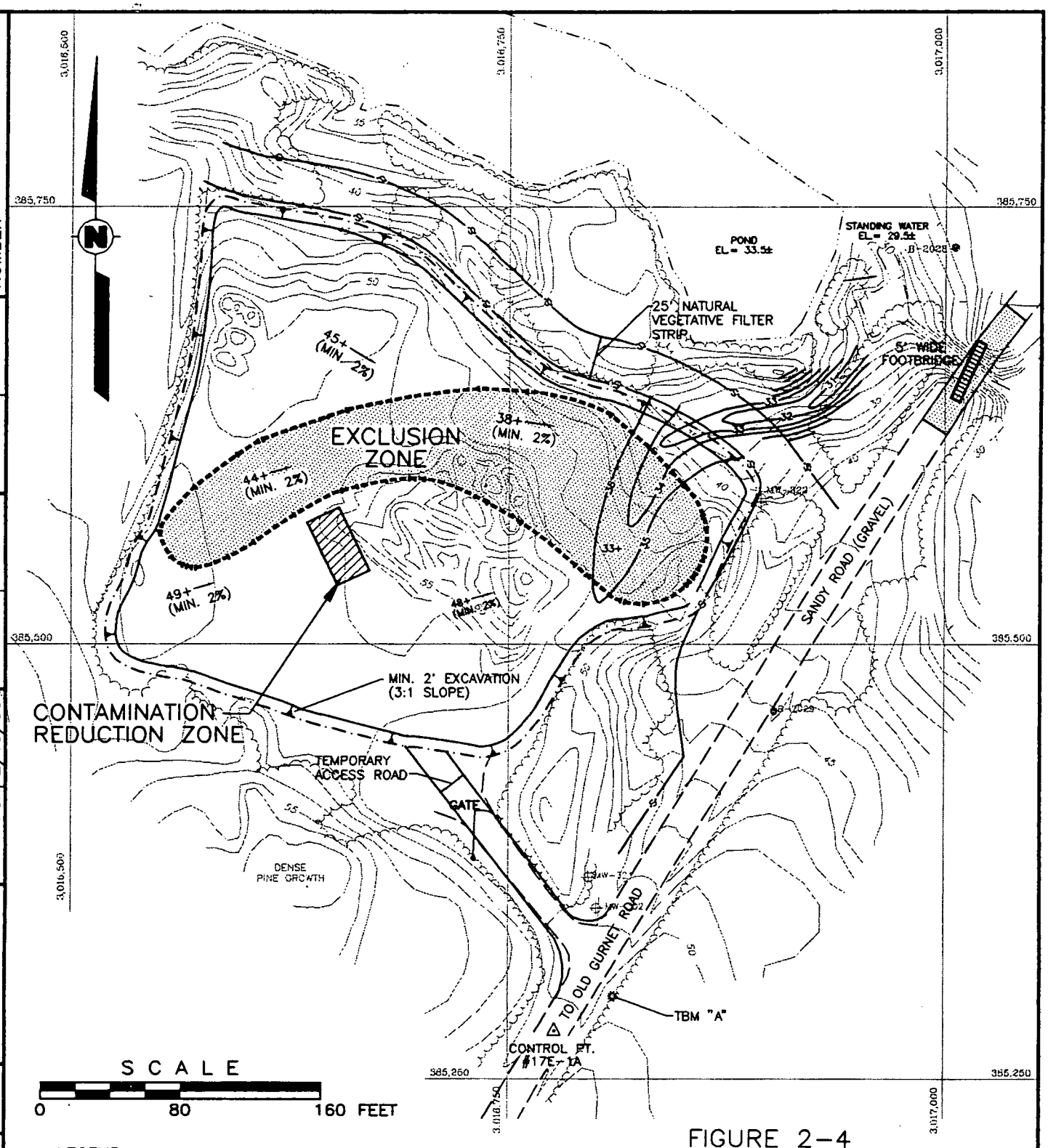
PLOT SCALE: 1 = 60



LEGEND:

- SILT FENCE
- PROPOSED CONTOURS
- EXCLUSION ZONE
- CONTAMINATION REDUCTION ZONE

REFERENCE:

1. DRAWING PREPARED FROM SHEET C-22 PREPARED BY ABB ENVIRONMENTAL SERVICES, INC.

FIGURE 2-4

SITE 6 WORK ZONES

REMEDIATION OF SITES 1, 3, 5, 6, AND 8
NAVAL AIR STATION, BRUNSWICK, MAINE

PREPARED FOR

DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PENNSYLVANIA

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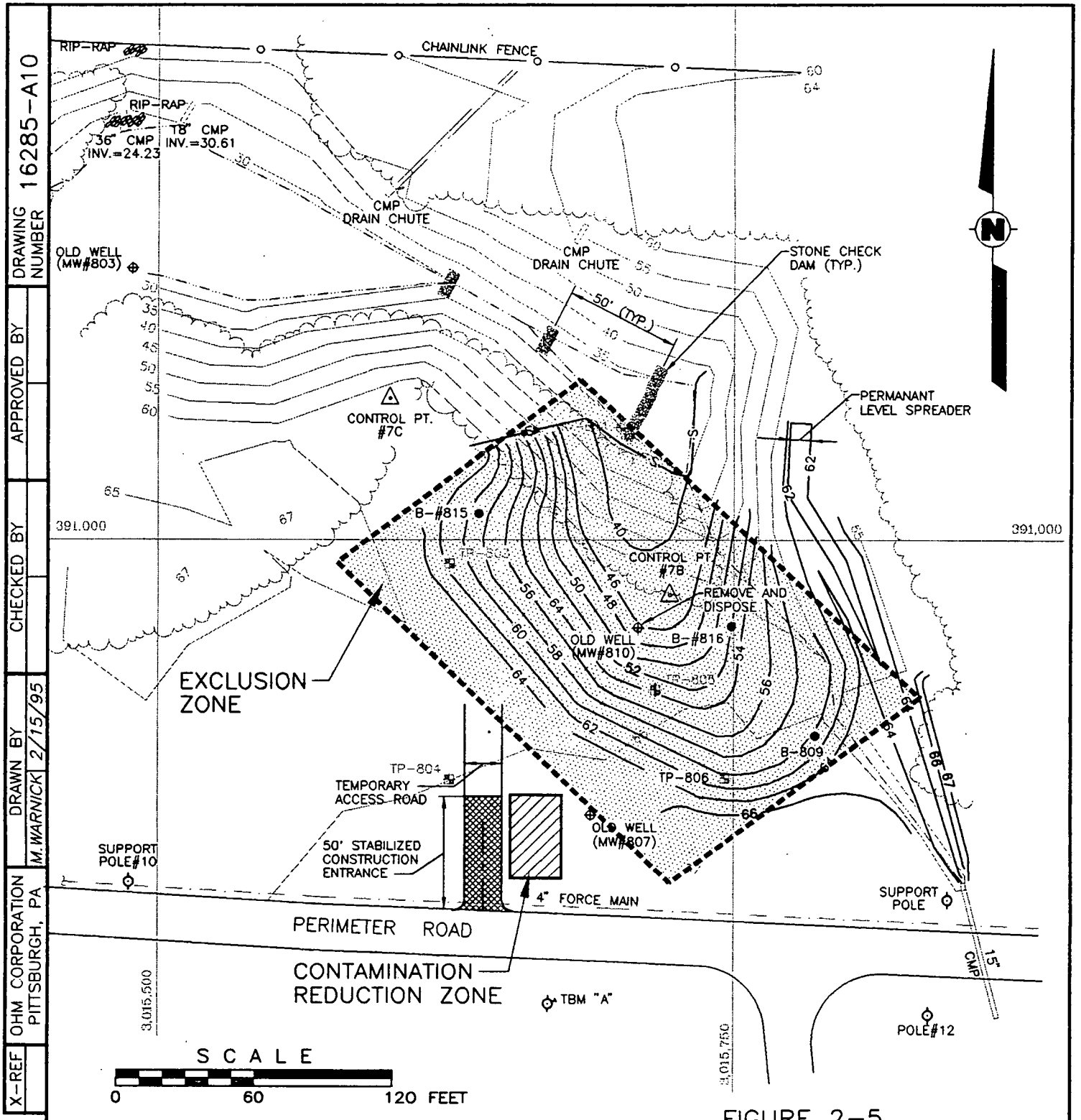
PLOT SCALE: 1 = 80



LEGEND:

- SILT FENCE
- PROPOSED CONTOURS
- EXCLUSION ZONE
- CONTAMINATION REDUCTION ZONE

REFERENCE:

1. DRAWING PREPARED FROM SHEET C-23 PREPARED BY ABB ENVIRONMENTAL SERVICES

FIGURE 2-5

SITE 8 WORK ZONES

REMEDIATION OF SITES 1, 3, 5, 6, AND 8
NAVAL AIR STATION, BRUNSWICK, MAINE

PREPARED FOR

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NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PENNSYLVANIA

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OHM CORPORATION PITTSBURGH, PA
X-REF
PLOT SCALE: 1 = 60

3.0 DATA QUALITY OBJECTIVES

3.1 PROJECT OBJECTIVES

The following sampling and analytical tasks have been identified for the successful remediation of Sites 1, 3, 5, 6 & 8:

- Sampling and analysis of soil from the floors of the excavations to verify cleanup levels have been met.
- Sampling and analysis of operations generated wastes such as PPE and decontamination fluids for disposal.
- Sampling of the air around the excavation areas (see Asbestos Abatement Plan) to confirm ambient air is no threat to workers or the public.

Analytical turn around times will be required to be quick enough to avoid scheduling delays.

3.1.1 Excavation Analysis

Soils from the excavation will be analyzed for the contaminants in Table 3.1. Cleanup levels for each group of analytes are found in Table 3.2.

3.1.1.1 Organic Analysis

The detection of VOCs, SVOCs, pesticides, PCBs or asbestos at depth will indicate that soil contamination is present. Excavation will continue until all contaminated soils have been removed and the above-mentioned contaminants are undetectable.

3.1.1.2 Inorganic Analysis

Analytical results will be compared with background concentrations in subsurface soils at locations to be determined on-site. Background sample locations will be selected by mutual agreement of OHM and the Navy representative(s) on-site. Excavation will continue until background levels have been achieved, as per specifications.

3.1.2 Waste/Disposal Analysis

If it becomes necessary, site generated wastes will be sampled for proper disposal or handling prior to removal from the site. OHM's standard operating procedures (SOPs) for sampling are included in Appendix A. The wastes may include discarded PPE, used carbon, equipment wipe samples, or excavated soil wastes. These wastes will be analyzed for the appropriate parameters listed in Table 3.3.

Samples of stockpiled wastes awaiting off-base disposal will be sent to an off-site laboratory for testing of the appropriate parameters as listed in Table 3.2.

3.2 DATA QUALITY OBJECTIVES

USEPA currently defines five levels of data quality for environmental projects, which relate to data precision, accuracy, and completeness. NEESA has adopted three of these levels for data reporting. The five defined levels of data quality are:

1. Screening (Level 1): This provides the lowest data quality, but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to ARARs (Applicable or Relevant and Appropriate Requirements), initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives (bench-scale tests). These types of data include those generated on site through the use of organic vapor analyzers, temperature and conductivity meters and other similar real time monitoring equipment at the site.

2. Field Analyses (Level 2): This provides rapid results and better quality than in Level 1. Analyses include mobile lab generated data.

3. Engineering (Level 3)/NEESA Level C: This provides an intermediate level of data quality and is used for site characterization and engineering analyses. It may include mobile lab generated data and some analytical lab methods (e.g., laboratory data with quick turnaround used for screening, but without full quality control documentation).

4. Confirmational (Level 4)/NEESA Level D: This provides the highest level of data quality and is used for purposes of risk assessment, engineering design, and cost analyses. These analyses require full CLP (Contract Laboratory Program) analytical and data validation procedures in accordance with U.S. EPA recognized protection (SOWs OLM 03.1 and ILM 04.1).

5. Non-Standard (Level 5)/NEESA Level E: This refers to analyses by non-standard protocols, for example, when exacting detection limits, or analysis of an unusual chemical compound is required. These analyses often require method development or adaption. The level of quality control is usually similar to Level 4 data.

OHM will be generating data conforming to DQO Levels 1, 3/NEESA Level C and 4/NEESA Level D. NEESA Level D Deliverables shall be found in Table 3.4.

- DQO Level 1 corresponds to data generated during field screening with instrumentation.

- DQO Level 3/NEESA Level C data (without deliverables) will be generated for disposal analyses.

- DQO Level 4/NEESA Level D data (with deliverables) will be generated for all confirmatory excavation samples.

3.2.1 Laboratory Methods

The subcontract project laboratory will conduct all analyses using accepted EPA methodology. Table 3.1 displays the intended analytical protocols for the project.

3.2.2 QA/QC Samples

To support the development of a proper data package, OHM will generate the following QA/QC samples during field sampling events for every 20 samples collected.

3.2.2.1 Equipment Rinsate Blanks

Equipment rinsate blanks are generated by passing laboratory quality water across a decontaminated sampling instrument and collecting the rinsate into the proper container. It is then handled in the same manner as all other analytical samples. This sample is a measure of the amount of cross contamination that may be occurring due to the sampling equipment. The equipment rinsate blank is analyzed for the same parameters the samples are receiving for that day. They will be generated at a frequency of one per twenty samples or one per day of sampling.

3.2.2.2 Field Duplicates

Field duplicates will be field generated to support the precision of field sampling and analytical techniques.

Field duplicate soil samples for volatile organics analysis will be collected as two grab samples from adjoining locations. Field duplicates for all other analyses shall be portions of composited samples.

3.2.2.3 Trip Blanks

Trip blanks are provided by the contract laboratory and serve as a means to identify the occurrence of sample contamination during shipment. A trip blank will accompany each sample cooler containing samples for volatile analyses.

3.2.2.4 Matrix Spike/Spike Duplicates

Matrix spike/spike duplicate samples will be analyzed as a means of assessing the accuracy of the analytical technique. This assessment will be done through monitoring the percent recoveries of the spiking compounds, which in turn will provide information on the extraction efficiency of the target compounds from the soils being sampled.

TABLE 3.1
ANALYTICAL PARAMETERS OF CONCERN FOR SITES 5, 6 & 8
AT THE NAS, BRUNSWICK, MAINE

Parameter	Site	Matrix	Method
TCL Volatile and Semi-volatile Organic Compounds, Pesticides and PCBs	6 & 8	Soil	OLM03.1
TAL Inorganic Compounds	6 & 8	Soil	ILM04.0
Volatile Organic Compounds	6 & 8	Soil	8240
Semi-volatile Organic Compounds	6 & 8	Soil	8270
Pesticides and PCBs	6 & 8	Soil	8080
Inorganic Compounds (except mercury)	6 & 8	Soil	6010
Mercury	6 & 8	Soil	7470
Asbestos	5 & 6	Soil	Polarized Light Microscopy (PLM)

TABLE 3.2
CLEANUP LEVELS FOR LANDFILLS 1, 3, 5, 6 & 8
NAS, BRUNSWICK, MAINE

Analyte	Site	Cleanup Level (mg/kg)
Volatiles	6 & 8	No compounds detected
Semivolatiles	6 & 8	No compounds detected
Pesticides/PCBs	6 & 8	No compounds detected
Inorganics	6 & 8	
Aluminum		7,700
Antimony		--
Arsenic		8.2
Barium		27
Beryllium		0.9
Cadmium		--
Calcium		790
Chromium		12
Cobalt		5.9
Copper		8.1
Iron		11,000
Lead		6.2
Magnesium		3,300
Manganese		260
Mercury		0.025
Nickel		9.9
Potassium		1,800
Selenium		0.22
Silver		--
Sodium		160
Thallium		0.17
Vanadium		20
Zinc		26
Cyanide		--

TABLE 3.3
OHM GUIDELINES FOR DISPOSAL ANALYSIS

Analysis	*Method(s)*
PACKAGE A [ALL SAMPLES]	
Total Solids	160.3
Corrosivity, pH	150.1, 9040, 9045
Flash Pt. Ignitability	1010, 1020
Reactive Sulfide	Sec. 7.3.4.1
Reactive Cyanide	Sec. 7.3.3.2
TCLP Volatile Organics	1311 - 8240, 8260
TCLP Semi-Volatile Organics	1311 - 8270
TCLP Metals	1311 - 6010, 7000's
TCLP Pesticide/Herbicides	1311 - 8080/8150
TCL Volatile Organics	8240, 8260
TCL Semi-Volatile Organics	8270
TCL Pesticide/PCBs	8080
TCL Herbicides	8150
PACKAGE B [INCINERATION DISPOSAL] Package A plus the following:	
% Ash	160.4
BTU	ASTM
Total Halides	9020
Total Sulfur	ASTM
Total Cyanide	9010
TAL Metals and Molybdenum	6010, 7000's
PACKAGE C [LANDFILL DISPOSAL] Package A plus the following:	
Paint Filter Test	9095
Total Cyanide	9010
Total Organic Halogens (TOX)	9020
PACKAGE D [WASTEWATER TREATMENT] Package A plus the following:	
Total Sulfide	376.2, 9030
Total Cyanide	9010
Total Phenols	420.1, 9065
TAL Metals and Molybdenum	6010, 7000's

TABLE 3.4
NEESA LEVEL D DATA DELIVERABLES

PARAMETER	METHOD REQUIREMENT	FORM
ORGANIC QC SUMMARY	Surrogate Percent Recovery Summary	Form II
	Matrix Spike/Matrix Spike Duplicate Summary	Form III
	Method Blank Summary	Form IV
ORGANIC SAMPLE DATA	Target Compound Results - Organic Analysis Data Sheet - tabulated results	Form I
	Copies of chromatograms[1]	
	Copies of chromatograms from second GC column (confirmation column)	
	GC integrator report or data system print-out	
	Manual work sheets	
	Raw spectra, background-subtracted mass spectra and background-subtracted standard spectra of any target compounds identified	
ORGANIC STANDARDS DATA	Initial calibration of single component analytes	Forms VI-1 and - 2
	Initial calibration of multicomponent analytes	Form VI-3
	Analyte resolution summary	Form VI-4
	Calibration verification summary - performance evaluation mixtures and instrument blanks	Form VII-1
	Calibration verification summary - mid-point concentrations of individual standard mixtures and instrument blanks used for calibration verification	Form VII-2
	Analytical sequence	Form VII
	Florisil cartridge check - all lots	Form IX
	GPC calibration - all GPC columns	Form IX-2
	Identification summary for single component analytes	Form X-1
	Identification summary for multi-component analytes	Form X-2
	Chromatograms and data system print-outs for all standards[2]	
ORGANIC STANDARDS DATA	Print-out of retention times and peak heights or peak areas[3]	

TABLE 3.4
NEESA LEVEL D DATA DELIVERABLES

PARAMETER	METHOD REQUIREMENT	FORM
	A copy of the computer reproduction output covering the entire calibration range for each initial calibration	
	GPC Calibration Data - UV detector traces for each compound peak in the GPC calibration mixture	
ORGANIC RAW GC DATA	Blank Data - in chronological order by blank type - include chromato-grams and data system print-outs for each GC column	Form I
	Matrix Spike Data - tablulated results of target compounds - include chromatograms and data system print-outs for each GC column	Form I
	Matrix Spike Duplicate Data - tablulated results of target compounds - include chromatograms and data system print-outs for each GC column	Form I
INORGANIC SAMPLE DATA	Tabulate and report sample analysis results	Form I-IN
INORGANIC STANDARD DATA	Initial and continuing calibration - report analyte recoveries from calibration solutions	Form II (Part 1)-IN
	CRDL Standard for AA and ICP - report analyte recoveries from analyses of the CRDL Standards for AA (CRA) and 2x CRDL Standards for ICP (CRI)	Form II (Part 2)-IN
	Blanks - report analyte concentrations in the Initial Calibration Blank (ICB), Continuing Calibration Blanks (CCB) and Preparation Blanks (PB)	Form III-IN
	ICP Interference Sample Check - report Interference Check Sample (ICS) results used in Sample Delivery Group (SDG) analyses	Form IV-IN
	Spike Sample Recoveries - report results of the pre-digestion spike	Form V (Part 1)-IN
	Post Digest Spike Sample Recovery - report results of the post digest spike recovery - based upon the addition of a known quantity of analyte to an aliquot of digested sample	Form V (Part 2)-IN
	Duplicates - report results of duplicate analyses - required for percent solid values and all analyte results	Form VI-IN

TABLE 3.4
NEESA LEVEL D DATA DELIVERABLES

PARAMETER	METHOD REQUIREMENT	FORM
INORGANIC STANDARD DATA	Laboratory Control Sample - report the results of the solid and aqueous Laboratory Control Samples	Form VII-IN
	Standard Addition Results - report the results of samples analyzed using the Method of Standard Addition (MSA) for Furnace AA analysis	Form VIII-IN
	ICP Serial Dilution - report the results for ICP serial dilution	Form IX-IN
	Instrument Detection Limits - QUARTERLY report of the instruments and wavelengths used to obtain data for the SDG	Form-X
	ICP Interelement Correction Factors - ANNUAL report for each instrument used to obtain data for the SDG - used for Al, Ca, Fe, Mg and one elemnt of the laboratory's choice	Form IX (Part 1)-IN
	ICP Interelement Correction Factors - ANNUAL report for each instrument used to obtain data for the SDG - used for elements other than Al, Ca, Fe, Mg and one elemnt of the laboratory's choice	Form IX (Part 2)-IN
	ICP Liner Range - QUARTERLY report of the linear range analysis of each instrument used to obtain data for the SDG	Form XII-IN
	Preparation Log - report the preparation run log including all samples, duplicates, matrix spikes, LCSs, PBs and repreparations - 1 per batch	Form XIII-IN
	Analysis Run Log - report the sample analysis run log including all field samples and all quality control analyses	Form XIV-IN
	Sample Log-in Sheet - document the receipt and inspection of samples and containers	Form DC-1
	Document Inventory Sheet - recorf the inventory of the Complete SDG File documents sent to the Region	Form DC-2

TABLE 3.4
NEESA LEVEL D DATA DELIVERABLES

PARAMETER	METHOD REQUIREMENT	FORM
1 - All sample chromatograms must be labled with the following information: EPA Sample Number; Volume injected (uL); Date and time of injecton; GC column identification (stationary phase and internal diameter; GC instument identification; Positively identified compounds must be labled with the names of compounds, either directly out from the peak or on a print-out of retention times if retention times are printed over the peak.		
2 - All standards includes: Resolution Check Mixture; All Performance Evaluation Mixtures; Individual Standard Mixture A, each initial calibration at three concentrations; Individual Standard Mixture B, each initial calibration at three concentrations; All multicomponent amalytes (Toxaphene and Aroclors) each initial calibration; All mid-point concentrations of Individual Standard Mixtures A and B used for calibration verification; Florisil cartridge check solution, all lots; GPC Calibration Check Solution, all calibrations relating to samples in the SDC; All multicomponent analyte standards analyzed for confirmation.		
3 - All standard chromatograms are required to contain the following: EPA Sample Number for the standard; Label all standard peaks for all individual compounds either directly out from the peak or on the print-out of retention times if retention times are printed over the peak; Total nanograms (ng) injected for each standard; Date and time of injection; GC column identification (stationary phase and internal diameter); GC instrument identification.		

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Data acquisition activities for the project will be accomplished using personnel from both OHM and the subcontracted analytical laboratories. A complete organization chart for the project is presented in Figure 4.1.

For this project, OHM personnel will be responsible for the following activities:

- Development and revisions to all project submittals and plans.
- Collection, documentation, and off-site shipment of all site samples.
- Maintaining project communication with the subcontract laboratory and any applicable USACE QA laboratory.
- Review and/or validation of all subcontract generated data.

A detailed discussion of OHM personnel titles, qualifications, and duties is presented in the subsection below. Laboratory personnel, as required in Section 01450 of the specifications, are presented in the subcontractor documents in Appendices B and C.

4.1 FIELD/PROJECT PERSONNEL

The following summarizes the project functions of the individuals presented.

- Project Manager - Responsible for the financial, safety, and quality performance of the job. Maintains project status interaction with Navy contacts.
- Program QA/QC Manager - Ensures all corporate, contract, and project procedures are followed. Reviews all data acquisition documents, and interacts with subcontract laboratory in a non-conformance situation.
- QA/QC Representative - specific functions are enumerated in the LANTDIV RAC QA/QC Program Plan. Job specific duties may include:
  - Maintaing compliance with the submittal register
  - Inspection of materials upon receipt
  - Securing subcontracted equipment specification sheets
- Senior Project Chemist - Responsible for data generation. Oversees site field sampling team. Supervises procurement, sample coordination and data review with off-site laboratory.
- Sample Technician - Implements all field sampling and completes field documentation. Transports and manages samples for off-site shipment.

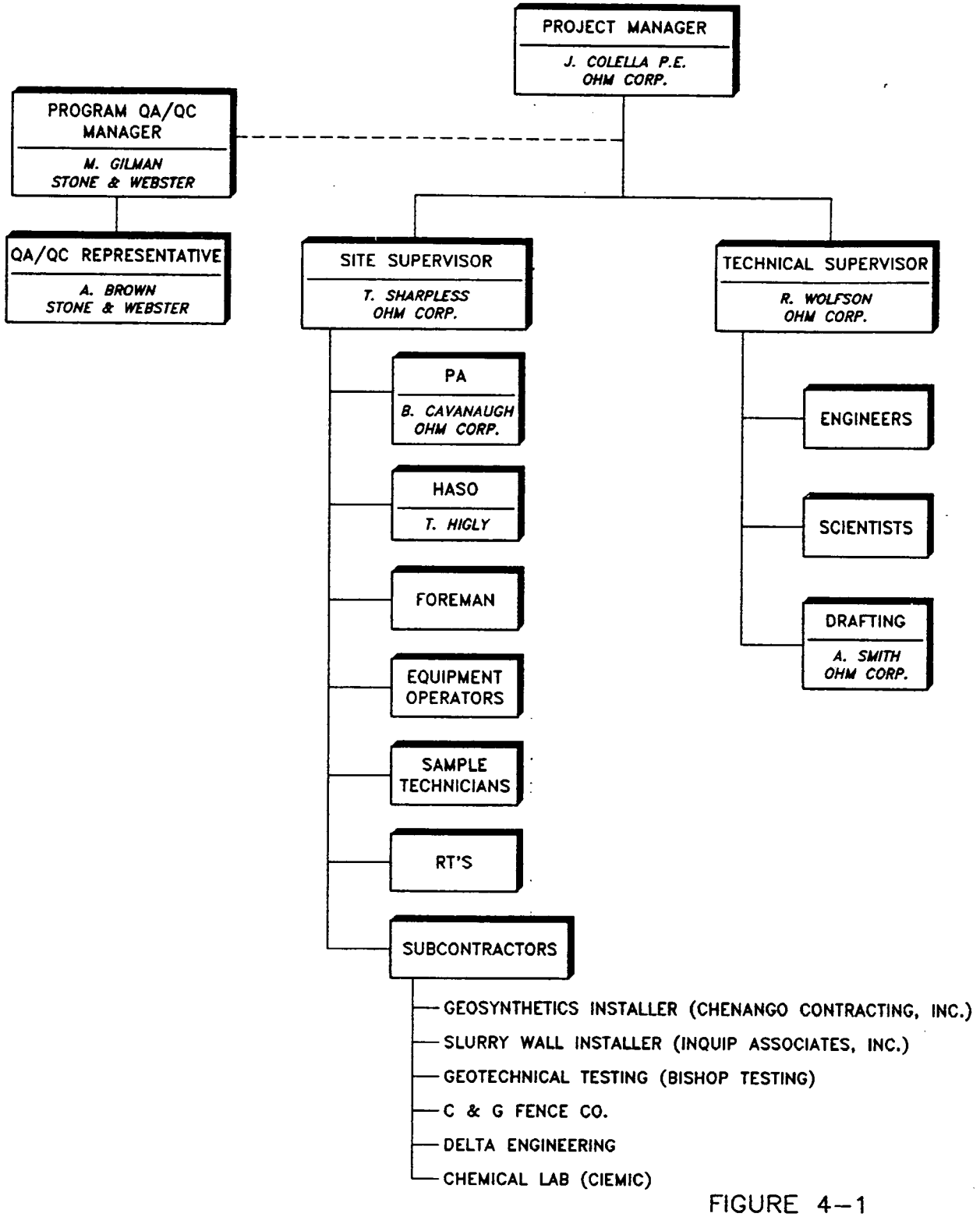

FIGURE 4-1

ORGANIZATION CHART
REMEDIATION OF SITES 1, 3, 5, 6, AND 8
NAVAL AIR STATION, BRUNSWICK, MAINE

PREPARED FOR

DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PENNSYLVANIA

OHM Remediation Services Corp.

DRAWING NUMBER 16285-A6
APPROVED BY
CHECKED BY
DRAWN BY M.WARNICK 1/31/95
OHM CORPORATION PITTSBURGH, PA
X-REF
PLOT SCALE: 1" = 1'

5.0 SAMPLING PROCEDURES

5.1 SAMPLING EQUIPMENT AND INSTRUMENTATION

Sample and preservation requirements shall be found in Table 5.1.

5.2 SAMPLING LOCATIONS

Samples shall be collected at Sites 5, 6 and 8. A minimum of three samples shall be collected from the floor of the excavation. These samples shall be representative of conditions within one vertical foot of the bottom of the excavation. Sample will be located by a Navy representative.

The location(s) of background sample(s) for inorganic parameters shall be determined on-site by mutual agreement of OHM and the Navy representative(s) on-site.

A complete list of sample containers, preservation methods and extraction/analysis holding times shall be found in Table 5.1.

5.3 SAMPLE PROCEDURES

Soil samples will be collected in accord with OHM Standard Operating Procedures on Surface Soil Sampling (QP609) and Auger Sampling (for subsurface soil samples, QP628). Each technique is summarized below.

5.3.1 Surface Soil Sampling

Surface soil samples will be collected using procedures to maximize the representativeness of the sample. These procedures include:

- Determination of the location and number of samples along with duplicate sample locations.
- The use of appropriate sample gloves and hand-held excavation tools.
- The frequent change of sample gloves and equipment to avoid cross-contamination between depths in a hole.
- Proper decontamination of sampling equipment before each use will not be required since disposable scoops will be utilized.

The complete Surface Sampling SOP (QP609) may be found in Appendix A.

5.3.2 Subsurface Soil Sampling

Shallow surface soil samples will be collected using a continuous flight or bucket auger sampling device. Care will be taken to eliminate the possibility of cross-contamination while using an auger device by decontaminating it before it is used at a new sample collection location. The complete Shallow Surface Sampling SOP (Augers, QP 628) may be found in Appendix A.

5.3.3 Waste Sampling

For drum and containerized wastes, one of the following methods will be used. The complete drum sampling SOP (QP608) may be found in Appendix A.

5.3.3.1 Liquid Wastes

Liquids in a container will be sampled using 4 foot sections of glass tubing or pipette (8 to 12 mm ID). The pipette is slowly lowered into the drum. When the bottom of the drum is reached, the sampler places a thumb over the end of the pipette and retrieves it. Any liquid or sludge layering in the container should now be apparent as the tube is brought up. The contents of the tube are then released into an 8-ounce sampling bottle. The process is repeated until sufficient sample has been collected. Sludge or solids underneath a liquid may be sample by forcing the pipette into it. If the sludge does not run out into the jar, shaking the pipette or tapping it against the side of the bottle may loosen the sample. If this fails, the sampler may intentionally break the pipette and put the pieces which have the solid in them into the bottle.

5.3.3.2 Solid and Semi-Solid Wastes

Solids in a container will be sampled with an inert sample scoop. The sample will then be transferred to a pre-cleaned, clear glass, 8-ounce, wide-mouth sample container. If the material must be broken up prior to sampling, a brass hammer and chisel will be used. If the material is too elastic, a piece will be cut off with a razor knife. Reusable sampling tools used will be decontaminated between containers.

5.3.3.3 Stockpiled Solid Waste Sampling

Solid wastes which are stockpiled for off-base disposal will be sampled with a stainless-steel hand auger which will be pushed into the stockpile 2 feet to collect a grab sample. Five grab samples will be collected around the circumference of the stockpile and completely mixed into a single composite sample for analyses. One grab sample location will be selected to obtain a sample for any required volatile organic analyses.

5.4 DOCUMENTATION

Accurate documentation of all sample procedures is critical to the sampling process. Types of documents which are considered essential and must be accounted for include:

Notes	Maps	Drawings
Photographs	Safety plans	QA plans
Log books	Data sheets	Reports

These link the sample with the project, sampler, time, location, procedures, changes to the work plan, sample history, transfer to the laboratory, and ensures tamper-free transit. As stated in a memorandum dated April 12, 1995, from the Navy, sample locations will be located by a Navy representative from areas where staining is apparent (if any).

Data, calibration, and maintenance records, samples, and documents, must be accounted for and retrievable at any time during an investigation. Chain-of-custody records are necessary to document sample identity, handling, and shipping procedures.

5.4.1 Sample Numbering

Samples obtained for the project will be identified by a unique sample number. The sample number will consist of:

- A two-letter abbreviation, which will indicate the sample matrix:
  - -- PE - Personnel Protective Equipment
  - -- SB - Subsurface Soil
  - -- SS - Surface Soil
- Site number (5, 6, or 8)
- Three numeric characters denoting the sample number
- Examples:
  - -- SS 5-094

5.4.2 Sample Label

- The sample label will contain the following additional information:
  - -- Sample Number
  - -- Date
  - -- Time (Military)
  - -- Sample Description
  - -- Preservatives used
  - -- Samplers Initials
  - -- Witnesses Initials
  - -- Number of Containers
  - -- Required Analysis

The sample description will note the sample type, e.g. confirmation sample and the depth at which the sample is obtained.

5.4.3 Field Sampling Log Book

The OHM Sample Technician (Tech) will maintain a detailed, accurate account of the sampling event in the Field Sampling Log Book. The Field Sampling Log will contain:

- All information found on the sample label, as listed above.
- Other information such as:
  - -- Weather conditions
  - -- Personnel on-site
  - -- Site map which indicates sample locations
  - -- Name of analytical lab

- The log book will also include a Table of Contents.

- Chain-of-custody information includes the names of the individuals involved in a custody transfer, a custody number (from the upper right corner of the COC form, a list of all samples for which the COC form applies.

5.5 SAMPLE PACKAGING AND SHIPMENT

Samples shall be packaged for shipment in the following manner:

1. Each sample container, properly identified and with a sealed lid, is placed in a polyethylene bag.

2. The sample is placed in a cooler previously lined with a large polyethylene bag.

3. The cooler is then packed with enough ice and non-combustible, adsorbent, cushioning material to preserve the samples during transport and minimize sample container breakage.

4. The large bag is closed and sealed.

5. The COC is placed in a Ziploc™-type bag and taped to the inside lid of the container.

6. The outer container is closed and sealed.

7. The outside of the container is marked
   - ORM-E NA 9188
   - Inside packages comply with prescribed specifications
   - "This End Up" on the top and four sides of the container.

TABLE 5.1
SAMPLE CONTAINERS, PRESERVATIVES AND EXTRACTION/ANALYSIS HOLDING TIMES FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

Analytical Parameter	Method	Container	Preservatives	Holding Times[1]	
				Extraction	Analysis
TCL Volatile Organics	OLM03.1	4 oz. G[2]	4° C, dark, 0.08% $Na_2S_2O_3$ if residual Cl_2	N/A[3]	10 days
TCL Semivolatile Organics	OLM03.1	32 oz. amber G	4° C, dark	10 days	40 days
TCL Pesticides and PCBs	OLM03.1	32 oz. amber G	4° C, dark	10 days	40 days
TAL Inorganics (except mercury)	ILM04.0	4, 8, 16 or 32 oz. FG[4]	4° C	N/A	180 days
Mercury					26 days
Volatile Organics	8240	4 oz. G	4° C	N/A	14 days
Semivolatile Organics	8270	8 oz. G	4° C	14 days	40 days from extraction
Pesticides & PCBS	8080				
Inorganics (except mercury)	6010	8 oz. G	4° C	N/A	180 days
Mercury	7470				28 days
Asbestos	NIOSH 9002	4 oz. G	N/A	N/A	N/A

1) TCL and TAL holding times begin at the laboratory's validated time of sample receipt (VTSR). All other holding times begin with sample collection.
2) G - Glass with polypropylene cap and white Teflon liner
3) N/A - Not Applicable
4) FG - Flint glass with black phenolic cap and polyethylene liner

6.0 SAMPLE CHAIN OF CUSTODY

Because of the evidentiary nature of samples collected during enforcement investigations, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings.

Documentation of sample custody following collection is accomplished using a standard Chain-of-Custody Record. This document traces possession of every sample from the time of collection through sample analysis.

In general, chain of custody protocols follow those outlined in USEPA guidelines. This documentation begins immediately following sample collection and proper labeling. The chain-of-custody record provides information on the sealing of samples, the sample number, sample description, date and time of collection, number of containers for the sample, type of analysis requested, and any pertinent remarks are entered onto the chain of custody record form, an example of which is shown in Figure 6.1. The chain-of-custody record form also documents the condition of sample containers upon their receipt from the support laboratory. This form is completed using indelible black ink.

6.1 INSTRUCTIONS FOR COMPLETING CHAIN-OF-CUSTODY RECORD

1. Project Name - Name assigned by OHM (generally the client company's name or the facility at which the work is being performed).

2. Project Location - City and state in which the project is located; use street address if possible.

3. Project Number - Number assigned by OHM (16285).

4. Project Contact - Usually an OHM employee who is responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given (i.e., project chemist or project scientist).

5.. Project Telephone Number - Telephone number of OHM on-site office trailer or number where person responsible for samples (project contact) can be contacted. On a short term project, enter the Project Manager's number.

6. Client Representative - The individual employed by the client to oversee and coordinate work performed by OHM on-site (i.e., contract coordinator, OSC, OSR).

7. Project Manager/Supervisor - The name of the OHM designated project manager or site supervisor should be entered here.

8. Sample Number - Number assigned in the field during collection of samples.

9. Date - Date of sample collection.

10. Time - Time of sample collection (24-hour time).

11. Composite/Grab - Checkmark (✓) in the appropriate column to indicate whether sample is composite or grab.

OHM Corporation

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
143085 Rev. 08/89

O.H. MATERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

PROJECT NAME	PROJECT LOCATION	
PROJ. NO.	PROJECT CONTACT	PROJECT TELEPHONE NO.
CLIENT'S REPRESENTATIVE	PROJECT MANAGER/SUPERVISOR	

ITEM NO.	SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS)	REMARKS
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME	REMARKS
1						
2						
3						
4						SAMPLER'S SIGNATURE

12. Sample Description (Include Matrix and Point of Sample) - Indicate whether sample is soil, liquid, air, oil, etc., along with any useful description, such as appearance (color, density, odor, etc.) Includes the location, designation, such as monitoring well number, soil sample coordinates, or EPA description number. This information must be the same as the sample label information.

13. Number of Containers - Number, size (capacity), and types of containers that are sealed and labeled for transfer to another location.

14. Analysis Desired (Indicate Separate Containers) - The name of the test (i.e., PCBs) or series of tests (VOAs) with method numbers is to be entered on the diagonal lines. For each sample container designated in the number of containers, a checkmark (✓) should appear in the column for the desired analysis.

15. Remarks - Enter sample specific instructions, cautions, or priorities (i.e., "do cyanide test first on this sample" or "caution may contain hydrofluoric acid;" also indicate preservation of sample (i.e., "sulfuric acid added"). Enter a sample specific comment (i.e., "sample lost in shipping").

16. Item Number - Each sample number is considered a separate item. Use sequential number (1,2,3...). Item numbers begin with No. 1 on each form. Do not carry item numbers from one form to another. List items 1,2,3... that you accepted.

17. Transfers Relinquished By - Name of person and affiliation transferring or surrendering the sample to another person, (do not use only the name of an organization).

18. Transfers/Accepted By - Person signing this part is responsible for the sample(s). In addition to the person's name, he should include his company name or agency(s) initial. Person accepting sample(s) is also responsible for making sure that all samples are accounted for when he signs an acceptance. If a common carrier is used, include the carrier name and bill-of-lading number or airbill number.

19. Date - Date on which sample is released to next person.

20. Time - Time at which sample is released to next person.

21. Remarks - Enter general instruction or requests, such as, fax report and turnaround times requested, preservatives added.

22. Sampler's Signature - The signature of the individual performing, or having immediate oversight of the sampling should appear in this section.

23. Laboratory name, telephone number, and contact.

6.2 FIELD CUSTODY PROCEDURES

In collecting samples for evidence, collect only that number which provides a fair representation of the media being sampled. To the extent possible, the quantities and types of samples and sample locations are determined prior to the actual field work. Minimization of sample transfers is always

considered. Sample labels shall be completed for each sample using indelible ink unless prohibited by weather conditions.

The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or properly dispatched. Throughout the course and at the end of the field work, the project chemist/scientist determines whether these procedures have been followed and whether additional samples are required.

6.3 TRANSFER OF CUSTODY AND SHIPMENT

Samples are accompanied by a chain of custody (COC) record. When transferring the possession of samples, the individuals relinquishing and receiving sign, date, and note the time on the record. The person receiving the samples should always inspect for correct sample description and sample count. This record documents transfer of custody of samples from the sampler to another person, a mobile laboratory, or an analytical laboratory. The original record will accompany the shipment, and a copy will be retained in the project files.

Samples will be properly packaged in accordance with DOT regulations for shipment and dispatched to the selected laboratory for analysis with a separate custody record prepared for each laboratory. COC records will be placed in a gallon Ziploc™ bag and taped inside the cooler lid.

Airbills from the courier will be retained as part of the permanent documentation. The person relinquishing the sample signs off his custody and enters the courier company's name and the bill-of-lading number or airbill number.

When samples are split with the facility or another government agency, a separate custody record is labeled to indicate this. In addition, the sample numbers from all the labels are recorded on the custody record. The person relinquishing the samples to the facility or agency should request the signature of a representative of the appropriate party, acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "received by" space. When appropriate (i.e., the representative is unavailable), the COC should contain a statement that the samples were delivered to the designation location at the designated time. The copy of the COC record may be given to the facility or agency upon request.

6.4 LABORATORY CUSTODY PROCEDURES

Once the sample arrives at the laboratory, custodial responsibility of the sample is transferred to that facility. The minimum requirements for a laboratory custodial system are:

- Designation of a sample custodian whose duties include:
  - Receiving samples
  - Inspecting and documenting sample conditions, e.g. temperature, pH, leakage, breakage, seals
  - Verifying and recording agreement of information on the sample documents
  - Marking/labeling of samples for laboratory use
  - Initiating paperwork within the laboratory
  - Distributing samples to appropriate analysts
  - Placing samples and extracts into the appropriate storage and/or secure areas
  - Controlling access to samples and extracts

  - Monitoring storage conditions for proper temperature and prevention of cross-contamination
  - Proper disposal of samples and extracts

- Secure appropriate storage for samples and extracts
- Sample tracking system
- Controlled access to storage areas
- Monitoring procedures for storage areas

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 FIELD INSTRUMENT CALIBRATION

All field laboratory instrumentation shall be calibrated according to manufacturer's specifications. Calibration procedures are included in the Health and Safety Plan.

7.1.1 HNU Photoionization Detector

HNU photoionization detector, model PI-101. The HNU shall be calibrated twice daily - morning and afternoon. The calibration gas shall be 100 Vppm isobutylene.

7.1.2 OVA Flame Ionization Detector

OVA flame ionization detector, model 128. The OVA shall be calibrated twice daily - morning and afternoon. The calibration gas shall be 100 Vppm methane.

7.2 CONTRACT LABORATORY INSTRUMENT CALIBRATION

The contract laboratory calibration procedures for all relevant Methods shall be found in the contract laboratory Quality Assurance Plan in Appendix B.

8.0 ANALYTICAL PROCEDURES

All analyses shall be performed by a laboratory certified by NEESA or otherwise approved to perform analyses for the Navy. Table 8.1 lists all required analytical methodology for this project.

8.1 ANALYTICAL METHODS

8.1.1 Site 5

Soil samples from site 5 shall be analyzed for asbestos by polarized light microscopy.

8.1.2 Site 6

Soil samples from site 6 shall be analyzed for the TCL VOCs, TCL SVOCs, TCL pesticides/PCBs and the Target Analyte Inorganics. Samples shall also be analyzed for asbestos by polarized light microscopy.

8.1.3 Site 8

Soil samples from site 8 shall be analyzed for the TCL VOCs, TCL SVOCs, TCL pesticides/PCBs and the Target Analyte Inorganics.

8.2 CONTRACT LABORATORY ANALYTICAL METHODS

The contract laboratory shall use the EPA CLP Statement of Work (SOW) OLM03.1 for Organic analytes and EPA CLP SOW ILM04.0 for Inorganic analytes for all post excavation/confirmation analyses. Disposal samples will be analyzed by SW-846 Methods 8240 (Volatiles), 8270 (Semi-volatiles), 8080 (Pesticides/PCBs), 6010 (Metals except mercury), 7470 (Mercury) and 9010 (Cyanide).

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
8240	CHLOROMETHANE	10	1250	D-273	19.8	≥ 90 %
	BROMOMETHANE	10	1250	D-242	17.9	
	VINYL CHLORIDE	10	1250	D-251	20.0	
	CHLOROETHANE	10	1250			
	METHYLENE CHLORIDE	5	625	D-221	7.4	
	ACETONE	100	12500			
	CARBON DISULFIDE	5	625			
	1,1-DICHLOROETHENE	5	625	D-234	9.1	
	1,1-DICHLOROETHANE	5	625	59-155	5.1	
	trans-1,2-DICHLOROETHENE	5	625	54-156	5.7	
	CHLOROFORM	5	625	51-138	6.1	
	1,2-DICHLOROETHANE	5	625	49-155	6.0	
	2-BUTANONE	100	12500			
	1,1,1-TRICHLOROETHANE	5	625	52-162	4.6	
	CARBON TETRACHLORIDE	5	625	70-140	5.2	
	VINYL ACETATE	50	6250			
	BROMODICHLOROMETHANE	5	625	35-155	6.4	
	1,1,2,2-TETRACHLOROETHANE	5	625	46-157	7.4	
	1,2-DICHLOROPROPANE	5	625	D-210	13.8	
	trans-1,3-DICHLOROPROPENE	5	625	17-183	10.4	
	TRICHLOROETHENE	5	625	71-157	6.6	
	DIBROMOCHLOROMETHANE	5	625	53-149	6.1	
	1,1,2-TRICHLOROETHANE	5	625	52-150	5.5	
	BENZENE	5	625	37-151	6.9	
	cis-1,3-DICHLOROPROPENE	5	625	D-227	15.8	
	2-CHLOROETHYL VINYL ETHER	10	1250	D-305	25.9	
8240	BROMOFORM	5	625	45-169	5.4	≥ 90 %
	2-HEXANONE	50	6250			
	4-METHYL-2-PENTANONE	50	6250			
	TETRACHLOROETHENE	5	625	64.148	5.0	

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	TOLUENE	5	625	47-150	4.8	
	CHLOROBENZENE	5	625	37-160	6.3	
	ETHYLBENZENE	5	625	37-162	7.5	
	STYRENE	5	625			
	XYLENES (TOTAL)	5	625			
8270	PHENOL	660	4950			$\geq$ 90 %
	bis(2-CHLOROETHYL) ETHER	660	4950	12-158	55.0	
	2-CHLOROPHENOL	660	4950	5-112	22.6	
	1,3-DICHLOROBENZENE	660	4950	D-172	41.7	
	1,4-DICHLOROBENZENE	660	4950	20-124	32.1	
	BENZYL ALCOHOL	1300	9750			
	1,2-DICHLOROBENZENE	660	4950	32-129	30.9	
	2-METHYLPHENOL	660	4950			
	bis(2-CHLOROISOPROPYL) ETHER	660	4950	36-166	46.3	
	4-METHYLPHENOL	660	4950			
	N-NITROSO-DI-N-PROPYLAMINE	660	4950	D-230	55.4	
	HEXACHLOROETHANE	660	4950	40-113	24.5	
	NITROBENZENE	660	4950	35-180	39.3	
	ISOPHORONE	660	4950	21-196	63.3	
	2-NITROPHENOL	660	4950			
	2,4-DIMETHYLPHENOL	660	4950	32-119	26.1	
	BENZOIC ACID	3300	24750			
	bis(2-CHLOROETHOXY) METHANE	660	4950	33-184	34.5	
	2,4-DICHLOROPHENOL	660	4950	39-135	26.4	
	1,2,4-TRICHLOROBENZENE	660	4950	44-142	28.1	
	NAPTHALENE	660	4950	21-133	30.1	
8270	4-CHLOROANILINE	1300	9750			$\geq$ 90 %
	HEXACHLOROBUTADIENE	660	4950	24-116	24.5	
	4-CHLORO-3-METHYLPHENOL	1300	9750	22-147	37.2	
	2-METHYLNAPTHALENE	660	4950			

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	HEXACHLOROCYCLO-PENTADIENE	660	4950			
	2,4,6-TRICHLOROPHENOL	660	4950	37-144	31.7	
	2,4,5-TRICHLOROPHENOL	660	4950			
	2-CHLORONAPTHALENE	660	4950	60-118	13.0	
	2-NITROANILINE	3300	24750			
	DIMETHYLPHTHALATE	660	4950	D-112	23.2	
	ACENAPHTHYLENE	660	4950	33-145	40.2	
	3-NITROANILINE	3300	24750			
	ACENAPHTHENE	660	4950	47-145	27.6	
	2,4-DINITROPHENOL	3300	24750	D-191	19.8	
	4-NITROPHENOL	3300	24750	D-132	47.2	
	DIBENZOFURAN	660	4950			
	2,4-DINITROTOLUENE	660	4950	39-139	21.8	
	2,6-DINITROTOLUENE	660	4950	50-158	29.6	
	DIETHYLPHTHALATE	660	4950	D-144	26.5	
	4-CHLOROPHENYL PHENYL ETHER	660	4950	25-158	33.4	
	FLUORENE	660	4950	59-121	20.7	
	4-NITROANILINE	3300	24750			
	4,6-DINITRO-2-METHYLPHENOL	3300	24750	D-181	93.2	
	N-NITROSODIPHENYLAMINE	660	4950			
	4-BROMOPHENYL PHENYL ETHER	660	4950			
	HEXACHLOROBENZENE	660	4950	D-152	24.9	
	PENTACHLOROPHENOL	3300	24750	14-176	48.9	
	PHENANTHRENE	660	4950	54-120	20.6	
	ANTHRACENE	660	4950	27-133	32.0	
	DI-n-BUTYLPHTHALATE	660	4950	1-118	16.7	
8270	FLUORANTHRENE	660	4950	26-137	32.8	$\geq$ 90 %
	PYRENE	660	4950	52-115	25.2	
	BUTYL BENZYL PHTHALATE	660	4950			
	3,3'-DICHLOROBENZIDINE	1300	9750	D-162	71.4	

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	BENZO(A)ANTHRACENE	660	4950	33-143	27.6	
	bis(2-ETHYLHEXYL) PHTHALATE	660	4950	8-158	41.6	
	CHRYSENE	660	4950	17-168	48.3	
	DI-n-OCTYLPHTHALATE	660	4950	4-146	31.4	
	BENZO(b)FLUORANTHRENE	660	4950	24-159	38.8	
	BENZO(k)FLUORANTHRENE	660	4950	11-162	32.3	
	BENZO(a)PYRENE	660	4950	17-163	39.0	
	INDENO(1,2,3-cd)PYRENE	660	4950	D-171	44.6	
	DIBENZO(a,h)ANTHRACENE	660	4950	D-227	70.0	
	BENZO(g,h,i)PERYLENE	660	4950	D-219	58.9	
8080	ALDRIN	2.68	40	42-122	0.42	$\geq$ 90 %
	a-BHC	2.01	30	37-134	0.48	
	b-BHC	4.02	60	17-147	0.64	
	g-BHC	6.03	90	19-140	0.72	
	d-BHC (LINDANE)	2.68	40	32-127	0.46	
	CHLORDANE (TECHNICAL)	9.38	140	45-119	10.00	
	4,4'-DDD	7.37	110	31-141	2.80	
	4,4'-DDE	2.68	40	30-145	0.55	
	4,4'-DDT	8.04	120	25-160	3.60	
	DIELDRIN	1.34	20	36-146	0.76	
	ENDOSULFAN I	9.38	140	45-153	0.49	
	ENDOSULFAN II	2.68	40	D-202	6.10	
	ENDOSULFAN SULFATE	44.22	660	26-144	2.70	
	ENDRIN	4.02	60	30-147	3.70	
	ENDRIN ALDEHYDE	15.41	230			
	HEPTACHLOR	2.01	30	34-111	0.40	
8080	HEPTACHLOR EPOXIDE	55.61	830	37-142	0.41	$\geq$ 90 %
	METHOXYCHLOR	117.92	1760			
	TOXAPHENE	160.8	2400	41-126	12.70	
	PCB-1016			50-114	10.00	

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	PCB-1221			15-178	24.40	
	PCB-1232			10-215	17.90	
	PCB-1242	43.55	650	39-150	12.20	
	PCB-1248			38-158	15.90	
	PCB-1254			29-131	13.80	
	PCB-1260			8-127	10.40	
NIOSH 9002	ASBESTOS					$\geq$ 90 %
OLM03.1	ACENAPHTHENE					$\geq$ 90 %
	ACENAPHTHYLENE					
	ACETONE					
	ALDRIN					
	ANTHRACENE					
	AROCLOR 1016					
	AROCLOR 1221					
	AROCLOR 1232					
	AROCLOR 1242					
	AROCLOR 1248					
	AROCLOR 1254					
	AROCLOR 1260					
	BENZENE					
	BENZ(a)ANTHRACENE					
	BENZO(b)FLUORANTHRENE					
	BENZO(k)FLUORANTHRENE					
	BENZOIC ACID					
	BENZO(g,h,i)PERYLENE					
	BENZO(a)PYRENE					
	BENZYL ALCOHOL					
	alpha-BHC					
	beta-BHC					
	delta-BHC					

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	gamma-BHC					
	bis(2-CHLOROETHOXY)METHANE					
	bis(2-CHLOROETHYL)ETHER					
	bis(2-CHLOROISOPROPYL)ETHER					
	bis(2-ETHYLHEXYL)PHTHALATE					
	BROMODICHLOROMETHANE					
	BROMOMETHANE					
	4-BROMOPHENYLPHENYL ETHER					
	BUTYLBENZYL PHTHALATE					
	CARBON DISULFIDE					
	CARBON TETRACHLORIDE					
	CHLORDANE					
	p-CHLOROANILINE					
	CHLOROBENZENE					
	p-CHLORO-m-CRESOL					
	CHLORODIBROMOMETHANE					
	CHLOROETHANE					
	CHLOROFORM					
	CHLOROMETHANE					
	2-CHLORONAPHTHALENE					
	2-CHLOROPHENOL					
	4-CHLOROPHENYLPHENYL ETHER					
	CHRYSENE					
	o-CRESOL					
	p-CRESOL					
	4,4'DDD					
	4,4'DDE					
	4,4'DDT					
	DIBENZO(a,h)ANTHRACENE					
	DIBENZOFURAN					

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	DI-n-BUTYL PHTHALATE					
	m-DICHLOROBENZENE					
	o-DICHLOROBENZENE					
	p-DICHLOROBENZENE					
	3,3'-DICHLOROBENZIDINE					
	1,1-DICHLOROETHANE					
	1,2-DICHLOROETHANE					
	1,1-DICHLOROETHYLENE					
	trans-1,2-DICHLOROETHYLENE					
	DICHLOROMETHANE					
	2,4-DICHLOROPHENOL					
	1,2-DICHLOROPROPANE					
	cis-1,3-DICHLOROPROPENE					
	trans-1,3-DICHLOROPROPENE					
	DIELDRIN					
	DIETHYL PHTHALATE					
	2,4-DIMETHYLPHENOL					
	DIMETHYL PHTHALATE					
	4,6-DINITRO-o-CRESOL					
	2,4-DINITROPHENOL					
	2,4-DINITROTOLUENE					
	2,6-DINITROTOLUENE					
	DI-n-OCTYL PHTHALATE					
	DI-n-PROPYLNITROSAMINE					
	ENDOSULFAN SULFATE					
	ENDOSULFAN I (alpha)					
	ENDOSULFAN II (beta)					
	ENDRIN					
	ENDRIN KETONE					
	ETHYLBENZENE					

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	FLUORANTHENE					
	FLUORENE					
	HEPTACHLOR					
	HEPTACHLOR EPOXIDE					
	HEXACHLOROBENZENE					
	HEXACHLOROBUTADIENE					
	HEXACHLOROCYCLOPENTADIENE					
	HEXACHLOROETHANE					
	2-HEXANONE					
	INDENO(1,2,3,c,d)PYRENE					
	ISOPHERONE					
	METHOXYCHLOR					
	METHYLETHYL KETONE					
	2-METHYLNAPHTHALENE					
	4-METHYL-2-PENTANONE					
	NAPHTHALENE					
	m-NITROANILINE					
	o-NITROANILINE					
	p-NITROANILINE					
	NITROBENZENE					
	2-NITROPHENOL					
	4-NITROPHENOL					
	N-NITROSODIPHENYLAMINE					
	PENTACHLOROPHENOL					
	PHENANTHRENE					
	PHENOL					
	PYRENE					
	STYRENE					
	1,1,2,2-TETRACHLOROETHANE					
	TETRACHLOROETHYLENE					

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	TOLUENE					
	TOXAPHENE					
	TRIBROMOMETHANE					
	1,2,4-TRICHLOROBENZENE					
	1,1,1-TRICHLOROETHANE					
	1,1,2-TRICHLOROETHANE					
	TRICHLOROETHYLENE					
	2,4,5-TRICHLOROPHENOL					
	2,4,6-TRICHLOROPHENOL					
	VINYL ACETATE					
	VINYL CHLORIDE					
	XYLENES (TOTAL)					
ILM04.0	ALUMINUM					$\geq$ 90%
	ANTIMONY					
	ARSENIC					
	BARIUM					
	BERYLLIUM					
	CADMIUM					
	CALCIUM					
	CHROMIUM					
	COBALT					
	IRON					
	LEAD					
	MAGNESIUM					
	MANGANESE					
	MERCURY					
	NICKEL					
	POTASSIUM					
	SELENIUM					
	SILVER					

TABLE 8.1
ANALYTICAL METHODS, ANALYTES, PRACTICAL QUANTITATION LIMITS (PQL), ACCURACY PRECISION AND COMPLETENESS FOR THE NAVAL AIR STATION, BRUNSWICK, MAINE SOIL EXCAVATION

METHOD	ANALYTE	LABORATORY PQL (ug/kg)		ACCURACY (% Rec.)	PRECISION (Std. Dev.)	COMPLETENESS
		LOW	HIGH			
	SODIUM					
	THALLIUM					
	VANADIUM					
	ZINC					
	CYANIDE					

ND - NOT DETERMINED
D - Detected; greater than zero

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 DATA REDUCTION AND TABULATION

Data generated from the site activities can be grouped into two broad categories:

- Field data, such as data collected during VOC screening
- Chemical data for environmental samples generated by the project laboratory and accompanying QA/QC data package deliverables as required for DQO Level II and Level III

These data will be compiled and managed using a central project filing system. The field and laboratory data filing system will be a manual storage system established at the Contractor's field office at the Site. Field and laboratory data will be filed chronologically. Field log books, sample logs, sample data sheets, chain-of-custody records, laboratory log books, and laboratory calculation sheets shall be labelled with a task number and date.

Chemical data shall be stored in a spread-sheet based system (e.g., LOTUS 123, EXCEL), with separate files maintained according to sample medium and validation status. The project laboratory shall provide the Project Coordinator and Contractor with computer diskette files containing the analytical data. Permits statistical analyses of data shall be performed at the Contractors expense.

9.2 GENERAL PROCEDURES FOR DATA REVIEW/VALIDATION

9.2.1 Level I Data

Level I data (e.g., screening for VOCs) will be validated by reviewing calibration and maintenance records for field instruments and field logbook information associated with individual data sets to ensure that appropriate SOPs were followed. Data validation, therefore, will be qualitative, and will focus on whether field screening data are of acceptable quality based upon supporting documentation. Acceptance or rejection of data will be determined by the judgement of experienced field personnel familiar with the SOPs.

9.2.2 Level II Data

Level II data will undergo qualitative and semi-quantitative review based on the standards or performance of the equipment in use. Acceptance or rejection of Level II data will be based on the judgement of qualified personnel. Level II review would include activities similar to Level I, i.e., review of instrument calibration concentrations.

9.2.3 Level III Data

Generation of the Level III data will include the analysis of QA/QC samples, including blanks, calibration and reference standards, and possibly spiked samples in some instances; a complete CLP QA/QC analysis program will be performed for these samples. Items that will be reviewed to validate the data include:

1) Integrity and completeness of the data package,

2) Holding times from sample receipt at the laboratory to sample extraction and analysis or holding times from sample receipt to analysis, as appropriate,

3) Trip blank and laboratory method blank sample results,

4) Matrix spike, matrix spike duplicate, and replicate analyses,

5) Surrogate recoveries,

6) Field blank sample results, and

7) Field duplicate results.

Data validation will be a qualitative process. Review of precision, accuracy, representativeness, completeness and comparability criteria will be included whenever measurement data are reviewed. The analytical laboratory will provide numerical precision and accuracy data that will be compared to the acceptance criteria. Precision and accuracy values for project data sets that are within the ranges for the type of sample and analytical method used will be considered acceptable. In some cases, data of apparently poor precision and/or accuracy may be somewhat useful. The judgement to accept such data, with appropriate qualifications, will be made by a data validator with appropriate technical expertise.

9.3 DATA REPORTING

OHM will provide all data results to the Project Manager, the USEPA and the DEP. Entries with associated quality assurance limitations will be appropriately flagged.

The project laboratory will report the data in a certificate of analysis format. Sample analytical results and accompanying QA/QC sample results will be reported to the Project Manager on computer diskette files suitable for transfer to the spreadsheet data base.

Analytical data will be identified according to the project laboratory's procedures for establishing sample lots, so that sample analysis data can be matched to corresponding QA/QC samples, control charts, and calibration data.

10.0 INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks procedures such as matrix spikes, replicates, control charts, blanks, etc. shall be found in the contract laboratory Quality Assurance Plan (Appendix B) or the Contract Laboratory Field Analytical Quality Assurance Plan (Appendix C). The results of these analyses and charts will be used to verify the stability of instrumentation and methods, as well as the ability of the laboratory to perform analyses reproducibly.

11.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits will be conducted as necessary by the contract laboratory. Other audits which may occur during the Project include, but are not limited to, field, data, health and safety, and laboratory audits.

12.0 PREVENTATIVE MAINTENANCE

Preventative maintenance procedures concerning downtime minimization and backup instrumentation shall be found in the contract laboratory's Quality Assurance Plan found in Appendix B, and/or the Contract Laboratory Field Analytical Quality Assurance Plan in Appendix C.

13.0 CORRECTIVE ACTION

Corrective Action is required if:

1. Any QC data is outside of the acceptable precision and/or accuracy
2. Blanks or laboratory control samples contain contaminants above acceptable limit
3. Undesirable trends are detected in spike or surrogate recoveries or RPD between duplicates
4. There are unusual changes in method detection limits
5. Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples
6. Inquiries concerning data quality are received from the Contracting Officer

13.1 CORRECTIVE ACTION PROCEDURES

Corrective actions/procedures for out of control events in the following areas shall be found in the contract laboratory's Quality Assurance Plan found in Appendix B and/or the Contract Laboratory Field Analytical Quality Assurance Plan found in Appendix C.

1. Incoming samples
2. Sample holding times
3. Instrument calibrations
4. Practical quantitation limits
5. Method QC
6. Calculation errors
7. On-site audits

Corrective actions will be implemented by various individuals, depending upon the location of the out of control event. Response to events on-site will be the task of the Site Supervisor, and the on-site laboratory manager if the event incudes the on-site laboratory. Corrective action at the off-site laboratory are the responsibility of the QA/QC Manager or designated representative.

14.0 DELIVERABLES

OHM will provide the Navy with the following deliverables:

- **Quality Control Daily Reports (QCDR)** will indicate all sampling, analysis, and quality control activities which were performed during for each day of on-site activities. All available data will be indicated on the QCDR. All contractor QC, NED analyzed, and associated QA samples, will be identified. All problems encountered and corrective actions will be noted. This will be submitted by 1000 the following workday.

- **Daily Work Orders (DWO)** will be completed. These will list all applicable personnel, equipment, and expendables purchased; which were to complete the days activities. The extent of project completion will be estimated as a percentage. Any field modifications will be noted on the DWO.

- **Conversation Records** will be maintained for all telephone calls, facsimile transmissions, site visits, and any other conversations pertinent to sampling, analysis, quality control, and related activities. A log-in sheet will be used to provide a tabular summary of the individual(s) involved and the date of each conversation.

- **Weekly Status Reports** will include summaries of all sampling, analytical, quality control, quality assurance, and related information from each week activities.

- **Monthly Monitoring & Performance Reports** will include all pertinent sampling, analytical, quality control, and related information necessary to support the discharge permit for the WTS.

- **Quality Control Summary Report** will be submitted to the Navy upon completion of the site activities. All quality control measures which relate to the sampling and analysis of wastewater and other relevant matrices will be discussed. The QC discussion will include laboratory data, tables, graphs, calibration curves, standards used, and any other information necessary to provide full discussion of applicable QC, to include problems encountered and corrective actions taken.

15.0 REFERENCES

The following references were used in the preparation of this CDAP:

- Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, NEESA 20.2-047B, June 1988, Naval Energy and Environmental Support Authority.
- OHM Field Sampling Manual; March 1989.
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., Sept. 1986 and Update #1, July, 1992
- EPA CLP Statement of Work OLM03.1
- EPA CLP Statement of Work ILM04.0

APPENDIX A

OHM CORPORATE
STANDARD OPERATING PROCEDURES

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-628	Title Augers

APPROVAL

Name	Title	Signature	Date
Willis Moody	Super. QA/QC		12/17/93
G. J. Herzig	Mngr. Field Tech.		12/17/93
Terry Sole	Dir. Tech. Svcs.		12/17/93

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									
3									
4									
5									
6									
7									
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9									
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OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Augers **Document #:** QP-628

Date Issued: January 17, 1994 **Rev:** 0 **Date:** December 17, 1993

1.0 PURPOSE

1.1 Provide information and operating procedures for auger sampling devices.

2.0 SCOPE

2.1 Augers are useful in combination with split spoon sampling devices. Augers are most commonly used to increase the size of a hole in order to drive a split spoon sampler to the next depth interval. However, one type of auger, the bucket auger, can be used for collection of samples. Although the bucket auger would be a poor choice when sampling for volatile compounds, it is a good choice for depth based composite sampling of a pile. Continuous flight augers can be used for collecting depth based composite soil samples

3.0 RELATED DOCUMENTS

3.1 ASTM E 300-73

4.0 GENERAL INFORMATION

4.1 Cross contamination is more of a problem when using the bucket auger than it is with most other soil sampling methods. Internal and external parts of the unit must be decontaminated.

4.2 Augers will generally be used in soil conditions that range from loose sand to compacted clayey and somewhat rocky soil.

5.0 DEFINITIONS

5.1 Composite Sample - Combination of more than one sample collected at various sampling locations and/or different points in time.

5.2 Cross Contamination – The introduction of contaminants into the sample through the sampling and/or sample-handling procedures which can cause an otherwise representative sample to become nonrepresentative.

5.3 Equipment (field) Blanks - Samples used to verify cleanliness of the sampling equipment. The piece of equipment in question is used to take a sample of distilled or deionized water. One per analyte per piece of equipment per day is recommended.

5.4 Grab Sample - A single sample representative of a specific location at a given point in time.

5.5 Representativeness - The sample should possess the same qualities or properties (which are relevant to the investigation) as the whole of the material under investigation.

6.0 RESPONSIBILITIES

6.1 Sample Technician is responsible for sample collection, documentation and equipment decontamination when soil augers are used.

7.0 PROCEDURE

7.1 Soil Sample Auger (Continuous Flights)

7.1.1 The soil sample auger is a screw- or worm-type instrument useful for taking samples of compacted materials. The procedure for taking samples with a soil sample auger is as follows:

7.1.2 Locate the desired sample point and clear the surface area of debris with a clean shovel.

7.1.3 Position the decontaminated auger on the sample point.

7.1.4 Rotate the auger in such a manner that it enters the material being sampled (augers in).

7.1.5 Once the auger has reached the desired depth it is pulled straight out.

7.1.6 Use a tongue depressor to remove sample material from the auger flights. Place the sample material directly into a clean sample jar.

7.1.7 After each use the auger must be decontaminated following site acceptable procedures.

7.2 Bucket Auger

7.2.1 The bucket auger is used for sampling in soil that is not too rocky or too hard. The procedure for taking samples with a bucket auger is as follows:

7.2.2 Locate the desired sample point. Clean the area of surface debris with a clean shovel.

7.2.3 Position the decontaminated bucket auger on the sample point.

7.2.4 Rotate the bucket auger in such a manner that it enters the material being sampled.

7.2.5 Once the bucket auger has reached the desired depth it is pulled straight out.

7.2.6 Use a tongue depressor to discard the top one inch of material from the bucket auger.

7.2.7 Using a clean tongue depressor, remove the sample from the bucket auger and place it into the appropriate sample container.

7.2.8 After each use the bucket auger must be decontaminated by site acceptable procedures.

8.0 EQUIPMENT

8.1 Augers

* Bucket auger, 3 1/4", with handle and ext. rods (AMS brand)

* Screw auger, 1 1/4", with handle and ext. rods (Forestry Suppliers P/N 77017)

8.2 Shovel, steel (Local Purchase)

8.3 Sample Containers, precleaned (OHM Supplied)

8.4 Sample Labels (OHM Supplied)

8.5 Sample gloves, latex or nitrile (PVC may or may not be acceptable - see CSAP)

8.6 Tongue depressors, wooden (VWR P/N 62505-006)

8.7 Trash bags, 30 gal., polyethylene (Local Purchase)

8.8 Decontamination Supplies

* Nitric acid, trace metal grade (VWR P/N JT9598-0)
* Hydrochloric acid, same grade (VWR P/N JT9530-0)
* DI water (Local Purchase)
* Isopropanol (2-Propanol)(VWR P/N JT9334-3)
* Alconox Detergent (VWR P/N 21835-032)
* Scrub brushes and tap water (Local Purchase)
* Wash buckets/tubs, ~3 - 5 gals. (Local Purchase)

8.9 Specific requirements of the site sampling and analytical plan may add to or delete from the above list.

9.0 ATTACHMENTS

Figure 9-1 Augers - Screw and Bucket Type

ORM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-609	Title Surface Soil Sampling

APPROVAL

Name	Title	Signature	Date
Willis Moody	Super. QA/QC		12/17/93
G. J. Herzig	Mngr. Field Tech.		12/17/93
Terry Sole	Dir. Tech. Svcs.		12/17/93

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									
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GHM Corporation

STANDARD OPERATING PROCEDURE

Title: Surface Soil Sampling **Document #:** QP-609

Date Issued: January 17, 1994 **Rev:** 0 **Date:** December 17, 1993

1.0 PURPOSE

1.1 To describe procedures for the collection of representative surface soil samples.

1.2 To describe procedures which minimize the exposure of sample technicians to contaminants.

2.0 SCOPE

2.1 This procedure provides information on proper equipment and techniques for surface soil sampling.

2.2 Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling techniques and by listing supplies and equipment needs.

3.0 RELATED DOCUMENTS

3.1 For a more in-depth discussion of soil sampling methods, refer to Preparation of Soil Sampling Protocol: Techniques and Strategies, (EPA 600/4-83-020) by Dr. Benjamin J. Mason, prepared under contract to the USEPA, Environmental Monitoring Systems Laboratory--Las Vegas, August 1983. This report discusses in detail the factors that influence the selection of a particular sampling scheme or the use of a particular sampling method with a strong emphasis on statistical design and data analysis. Another source, Soil Sampling Quality Assurance User's Guide, (EPA 600/4-84-043) by Dr. Delbert S. Barth and Dr. Benjamin J. Mason, prepared by the Environmental Research Center, University of Nevada, Las Vegas under a cooperative agreement with the USEPA (May 1984), will also be helpful.

4.0 GENERAL INFORMATION

4.1 Soils are often non-homogeneous and distribution of contaminants in a soil is often non-uniform. To offset these during sampling the following are accomplished.

4.1.1 Collect samples with high volume-to-surface area ratios.

4.1.2 Use a systematic (grid pattern) approach to sample collection.

4.1.3 Maintain a detailed record during sampling operations, particularly noting location, depth, and characteristics such as grain size, color and odor, and/or readings obtained on field monitoring equipment.

4.2 Soil sampling equipment needs to meet the following general requirements.

4.2.1 Materials of construction shall be stainless steel, plastic or teflon coated steel. Chrome plated or nickel plated steel should not be used. Brass sampling tools can be used for certain sampling operations as long as the brass (copper + zinc alloy) is non-contaminating and non-reactive to the sample medium.

4.2.2 Materials of construction shall be compatible with and non-reactive to compounds of interest.

4.2.3 Materials of construction will not leave residues in samples that will interfere with analyses of samples.

4.3 Soil bioactivity and problems with volatilization of organic compounds from the soil require that the following be accomplished for soil samples immediately after collection.

4.3.1 Tightly seal containers.

4.3.2 Refrigerate samples to ~4° C.

4.3.3 Remove samples from exposure to sunlight.

5.0 DEFINITIONS

5.1 Soil Sample- A sample of the soil taken to determine what type and quantity of contamination has been released into the soil.

5.2 Environmental Sample - low concentration sample typically collected off-site and not requiring DOT hazardous waste labelling as a high hazard sample.

6.0 RESPONSIBILITIES

6.1 Field Operations Leader

6.1.1 The Field Operations Leader is responsible for the overall safety of the sampling operation. This includes informing and obtaining help from local authorities if necessary, selection of sample points, and halt of operations if necessary.

6.2 Sampling Technicians

6.2.1 The Sampling Technicians are responsible for the following.

6.2.1 Reading and implementing project sampling plans.

6.2.2 Accumulating and dispatching appropriate supplies and equipment to accomplish the sampling objectives.

6.2.3 Locating and marking sampling points.

6.2.4 Decontaminating field sampling gear in a correct and appropriate manner consistent with site requirements.

6.2.5 Collecting, preserving, and packaging soil samples.

6.2.6 Maintaining sampling records, sampling logs, data sheets, and maps.

6.2.7 Filling out Chain-of-Custody forms.

6.2.8 Maintaining physical custody of samples until they are transferred off-site or to an on-site laboratory.

7.0 PROCEDURE

7.1 Surface Soil Sampling QA/QC

7.1.1 Quality control samples will be taken at the discretion of the client and OHM management. Often, provisions for quality control sampling will be included in the project CSAP.

7.1.2 Types of Quality Control samples that may be taken during a surface soil sampling effort could include Matrix Spike/Matrix Spike Duplicates, Field Spikes, Duplicates, and/or Split Samples.

7.2 Preliminary Assessment/Site Inspection

7.2.1 The preliminary assessment of existing data should be consulted in planning a surface soil sampling operation. Of special importance are items that can be used to characterize the types of hazardous materials present at the site (e.g., generator records, manifests, inventories, personal interview, and monitoring data).

7.2.2 In general, the preliminary assessment and site inspection should have been completed prior to sampling. Field characterization should help to establish ambient conditions and identify potential hot spots. This information is to be plotted on the site sketch. Observations from maps and aerial photographs can also be used in compiling the site sketch.

7.3 Site Preparation

7.3.1 Proper site preparation involves setting up the decon area, equipment storage area, sample storage area (if necessary), and preparation of sampling equipment (i.e., assembly of equipment, decontamination of equipment).

7.4 Location of Sampling Points

7.4.1 Prior to preparations for sampling and actual sample collection, sampling points are to be measured, located, and marked with surveyors stakes or flags. Measurements from a minimum of three location are obtained for ease in relocating these exact sample locations at a further

time. A site map will be generated detailing measurements from sample locations to fixed reference points. This will increase the efficiency of the sample collection process. In addition, it will aid others in relocation of sampling points at a later date.

7.5 Sampling Procedures

7.5.1 The steps to be followed in surface soil sampling are as follows:

7.5.1.1 Determine the number and location of desired samples along with the location of duplicate samples.

7.5.1.2 Don correct sample gloves and excavate a hole, 3 to 4 inches deep, with the decontaminated shovel or stainless steel spoon/spatula at the first sample location.

7.5.1.3 Don clean sample gloves, and scrape the side of the hole with a tongue depressor or stainless steel spoon/spatula to expose a fresh surface. This eliminates the possibility of cross contamination from material below.

7.5.1.4 Discard the first tongue depressor or stainless steel spoon/spatula, and use a new one to dig material from the top 2 inches of soil and transfer it into the sample jar. If the soil is too hard for this, chip the sample out with a clean chisel hammer or similar tool. After a small pile of loosened soil has accumulated, use a tongue depressor, spoon/spatula or trowel and put the material into the open sample jar.

7.5.1.5 After obtaining an adequate sample volume, seal the jar and label the sample container. Apply a custody seal if one is required. Then record the pertinent information in the field logbook.

7.5.1.6 Place used expendables in a trash bag. Decontaminate any non-disposable tools as described below.

7.5.1.7 Repeat steps 2 through 6 until all samples have been taken.

7.6 Sampling Equipment Decontamination

7.6.1 When dedicated equipment is not used for sampling, the sampling plan should include procedures for disassembly and cleaning of equipment befog each use.

7.6.2 Inorganic Constituents

7.6.2.1 If the constituents of interest are inorganic, the following steps will be followed:

7.6.2.1.1 Wash with Alconox and tapwater

7.6.2.1.2 Rinse with tapwater

7.6.2.1.3 Rinse with dilute (0.1N) hydrochloric acid or nitric acid.

7.6.2.1.4 Rinse with tapwater

7.6.2.1.5 Rinse with distilled water or deionized water

NOTE: Dilute hydrochloric acid is generally preferred to nitric acid when cleaning stainless steel because nitric acid may oxidize stainless steel.

7.6.3 Organic Constituents

7.6.3.1 If the constituents of interest are organic, the following steps will be followed:

7.6.3.1.1 Wash equipment with Alconox and tapwater

7.6.3.1.2 Rinse with tapwater

7.6.3.1.3 Rinse with distilled water

7.6.3.1.4 Rinse with pesticide free grade isopropanol

8.0 EQUIPMENT

8.1 The materials required to perform soil sampling may include the following.

* Chisel head hammer, 24 oz. (Forestry Suppliers P/N 33349)
* Scoop, plastic (VWR P/N 56920-025 or 56920-036)
* Trowel, pointing, steel (Forestry Suppliers P/N 53717)

* Spoon/spatula, stainless steel (VWR P/N 57952-107)
* Tongue depressors, wood (VWR P/N 62505-006)
* Clean shovel, steel (Local Purchase)
* Sample Containers, Precleaned Glass or Plastic of appropriate size.
* Sample labels (OHM Supplied)
* Custody seals (If required for project)
* Sample gloves, latex or nitrile (PVC may not be acceptable)
* Trash bags, 30 gallon, heavy duty (Local Purchase)
* Nitric Acid, trace metal grade (VWR P/N JT9598-0)**
* Hydrochloric Acid, trace metal grade (VWR P/N JT9530-0)**
* DI Water (Local Purchase)
* Isopropyl Alcohol (2-Propanol)(VWR P/N JT9334-3)
* Alconox Detergent (VWR P/N 21835-032)
* Scrub brushes and source of tap water (Local Purchase)
* Wash buckets or tubs/pans, ~5-gal. size (Local Purchase)
* Field logbooks (Sample Logbook and Field Sampler's Notebook)
* 200 ft. tape, Lufkin 1708D (Forestry Suppliers P/N 39961)
* Surveyor stakes (Forestry Suppliers P/N 39514).
* Marking pens, such as Sharpies and Mean Streaks
* Chain-of-custody Forms
* Compass, Silva (Type 3, 7, 20) (Forestry Suppliers or Local Purchase)

* Other OHM or site specific forms as required per CSAP

* Calculator, pocket size (Local or Individual Purchase)

* Mechanical pencil and graph paper (Local or Individual Purchase)

* Specific requirements of the site sampling and analytical plan may add to or delete from the above list.

9.0 ATTACHMENTS

None

APPENDIX B

CONTRACT LABORATORY QUALITY ASSURANCE PLAN

QUALITY ASSURANCE MANUAL FOR INDUSTRIAL HYGIENE ANALYSIS

MARCH, 1989

Revision 3, June, 1993
Revision 4, March, 1995

Prepared by:

Eva Galson, CIH
Quality Assurance Manager

Approved by:

Gale G. Sutton, CIH
Laboratory Director

GALSON LABORATORIES
Division of Galson Corporation

6601 Kirkville Road
East Syracuse, New York 13057

QUALITY ASSURANCE MANUAL FOR INDUSTRIAL HYGIENE ANALYSIS

REVISION INDEX

REVISION 1	JUNE, 1991	COMPLETE MANUAL REV.
REVISION 2	APRIL, 1992	COMPLETE MANUAL REV.
REVISION 3	JUNE, 1993	PARTIAL REVISION
REVISION 4	MARCH, 1995	PARTIAL REVISION

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QUALITY ASSURANCE MANUAL FOR INDUSTRIAL HYGIENE ANALYSIS

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QUALITY ASSURANCE MANUAL FOR INDUSTRIAL HYGIENE ANALYSIS

FIGURES AND TABLES

QUALITY ASSURANCE MANUAL FOR INDUSTRIAL HYGIENE ANALYSIS

1.0 INTRODUCTION

1.1 LABORATORY CHARACTERIZATION

Galson Laboratories, a division of Galson Corporation, is a full service environmental laboratory, analyzing industrial hygiene, ambient air, source emission, water and wastewater and hazardous waste samples. The laboratory provides analytical services to outside clients, as well as providing analytical support to our in-house staff of industrial hygienists, environmental scientists and engineers.

1.2 LABORATORY QA/QC MANUAL FOR INDUSTRIAL HYGIENE ANALYSIS

This QA/QC manual describes laboratory procedures to be employed in the analysis of air samples and the quality control procedures applied to the analytical work to ensure accuracy and precision. The manual further describes standard procedures for sample sign-in, sample custody, sample storage and analyst training.

It contains procedures for sample handling, calibration of instruments, record keeping and sample disposal. The procedure for writing analytical standard operating procedures (SOP) is outlined. This manual is updated to reflect revised methods and systems as needed. Such changes are made by the QA Manager and approved by the Laboratory Director.

Detailed SOPs for analytical procedures are found in the laboratory library, with copies in each analytical group's SOP manual.

2.0 SAMPLE HANDLING PROCEDURES

Sample custody begins when a sample is collected and ends when analytical data are delivered to the client and the sample is disposed of. It is important to be able to trace samples from collection to data reporting so that utmost confidence can be placed in the analytical results. To adequately detail this aspect of analytical quality control, the following topics will be discussed in this section:

1. Chain of Custody
2. Sample Labeling
3. Sample Receipt, Logging
4. Sample Storage and Disposal
5. Data Handling, Transfer and Report
6. Document Control

2.1 CHAIN OF CUSTODY

A chain of custody is a mechanism for tracing custody from the time of collection through reporting of results to sample disposal. The chain is initiated by the sampling agent who initiates a chain of custody form. As the samples are passed from individual to individual, the transfers are noted. This process continues until the samples are delivered to the laboratory, where the form is signed as received. The original chain of custody form is returned to the client with the analytical report, and a copy is retained with the project file.

2.2 SAMPLE LABELING

The importance of sample labeling cannot be overstated. Improperly or inadequately labeled samples are of little value. Improperly labeled samples lead to questions with regard to location, project, sampling station, date sampled and sampler. All of this information is essential for proper sample handling. The following information should be supplied with each sample:

Client	Date Collected
Project Number (Or Job No., if Applicable)	Time Collected
Location	Collected By
Collection Medium	Analysis Required
Air Volume or Pump Flow Rate and Time	

Preprinted pressure sensitive labels containing the above are available from the laboratory.

2.3 SAMPLE RECEIPT AND LOG-IN

Samples delivered to the laboratory are received by the Sample Custodian. Upon receipt, the samples are checked for possible damage, the number of samples received is checked against the number of samples sent, the analysis requested is reviewed, turnaround time and any possible discrepancies are noted. Samples which are packed or labeled in a way which could compromise sample integrity are not accepted for analysis. The Client Services Manager and appropriate Section Supervisors are notified immediately of all rush samples, those samples with special or unusual requirements or those whose integrity is in doubt. At this time, the client is contacted to discuss any discrepancies or damages which have occurred. After the preliminary review, the samples are recorded in the sample log-in book (Figure 2.1) and entered into the Laboratory Information Management System (LIMS). The LIMS generates a unique sample number, prints out two labels, one of which is affixed to the sample and the other to the internal chain of custody form (Figure 2.2).

2.4 SAMPLE STORAGE, SECURITY AND DISPOSAL

While in the laboratory, the samples requiring refrigeration are maintained in a walk-in cooler at 4 Degrees C unless they are being used for analysis. This cooler is equipped with a lock and is under the control of the Sample Custodian, who also maintains ultimate control of the samples while they are in the laboratory. Sorbent tubes and monitors are stored in a freezer. The samples are retained at the laboratory for two weeks (or longer if required by a client) after the report has gone out, so that any potential analytical problems can be addressed. At the end of the holding period, the samples are discarded.

Samples not requiring refrigeration, such as asbestos bulk samples and air sampling cassettes for fiber counts, metals, particulates, silica, etc., are stored in cabinets under the control of the Sample Custodian. For disposal, asbestos bulk samples are placed in heavy, yellow plastic bags, which are placed into fiber drums. Other hazardous materials are placed in lab packs. When full, the containers are picked up by a licensed waste hauler for disposal by procedures which meet all state and federal requirements. Detailed instructions on waste disposal are found in the Galson Laboratories Safety Manual, Section 11. Upon completion of waste disposal, a copy of the manifest is sent to Galson Laboratories and is filed with other laboratory waste manifests.

2.5 DATA HANDLING, TRANSFER, STORAGE

Technicians perform specific analyses and enter bench generated data into workbooks or laboratory records specific for each parameter. These records are under control of each respective Section Supervisor, who is responsible for their security. After a set of analyses has been completed, the results are calculated according to the methods specified in the procedural protocols using verified calculation routines. At least ten percent of these calculations are double checked. Those calculations checked will be indicated with a check mark. The signature of the reviewer and the date reviewed are placed on each document checked. The technician then enters the data into the LIMS system and the computer generated reports and the assembled data are given to the Section Supervisor for review. The Section Supervisor reviews the data for nonsense errors, computational errors and transcriptional errors and edits the data on the computer.

When satisfied with the quality of the data, the Section Supervisor approves the data and generates a report. The final data is reviewed by the Laboratory Director and the QA/QC Manager or their designees and forwarded to the client. An Analysis Specific Report Review Record (Figure 2.3) is completed for all data generated and filed.

All data generated in the laboratory is stored for no less than seven years or until the client releases it. This storage includes bench notebook entries, reports, tables, chromatograms and mass spectra. Data from instrument strip chart traces may be transcribed to the respective notebooks when not calculated by the LIMS. These strip chart traces will be kept on file for future reference. At least ten percent of all laboratory transcripts are verified by a second person.

All computer data is backed up on a regular schedule. Backup computer tapes are stored in a fireproof safe.

2.6 DOCUMENT CONTROL

The goal of the Document Control Program is to assure that all documents for a specified client (group of samples) will be accounted for when the project is completed. The program includes a document numbering and inventory procedure for preparation of the specified documentation packages for each client.

Each client is given an individual job number and all subsequent jobs for a specific client are given the same job number with individual task numbers. All documents pertaining to the specific job are filed in the work order files. These files are maintained for no less than seven years. The client may release documents sooner or request a longer holding period. The files are under the control of the laboratory secretary.

DATE RECEIVED:

ACCOUNT NAME	ACCT#	LOG-IN#	SAMPLE#	SAMPLE TYPE	DATE REPORT OUT	DATE SAMPLE DISPOSED

FIGURE 2.1

IH Report
Client: _____ Due Date: _____

Login #: _____ Client Account #: _____

Project Manager: _____

Inserts: Client Chain of Custody? Y N Other: _____

****

Reports Needed:	OK for final		Entry Serial #(s)	Invoice OK
Subcntr.	_____	_____	_____	_____
Asbestos	_____	_____	_____	_____
GC	_____	_____	_____	_____
HPLC	_____	_____	_____	_____
Metals	_____	_____	_____	_____
Wet Chem	_____	_____	_____	_____
GC/MS	_____	_____	_____	_____

****

FAX to: _____ FAX #: _____ FAX/Phone Date: _____

****

(Kim) Final report printed w/letter to QC (Pam for Asbestos): _____

****

(Eva or Pam) QC Review:

Corrections Needed:		Corrections Done:
Report	_____	_____
Invoice	_____	_____
Letter	_____	_____

Report QC complete & given to Gale: _____

****

(Anne Lee) Final Invoice Generated: _____

****

Letter, report, & invoice all to same person? Y N
If no, explain: To be mailed: US Mail/Overnight/2nd day air

Copies? Y N
If yes, explain:

****

MAILING INFO (Shelli) Copies made: Y N

			Originals	
Cover Letter	Y	N	Letter to:	_____
Report	Y	N	Report to:	_____
Invoice	Y	N	Invoice to:	_____
C. of C.	Y	N		
Other:	_____		Copies	
			Letter to:	_____
Mailed Via:			Report to:	_____
US Mail (Date):	_____		Invoice to:	_____
Fed-Ex (Date):	_____			
UPS (Date):	_____		or Internal Report delivered to:	_____

Figure 2-2

3.0 STAFF QUALIFICATIONS, TRAINING AND RESPONSIBILITIES

Galson Laboratories employs qualified staff and requires training, either short courses or formal in-house training, and demonstration of proficiency before an analyst is permitted to analyze client samples.

3.1 QUALIFICATIONS

Galson Laboratories endeavors to hire the most qualified staff for each position based on experience, past performance and motivation.

3.2 STAFF RESPONSIBILITIES

Figures 3.1 is a laboratory organizational chart. Figure 3.2 is a chart showing the laboratory's position in the Galson Corporation.

3.2.1 LABORATORY DIRECTOR

The Laboratory Director is responsible for laboratory operations. The Laboratory Director carries out administrative functions and oversees quality assurance activities within the laboratory.

3.2.2 QUALITY CONTROL COORDINATOR

The Quality Control Coordinator oversees all QA/QC activities. These activities include:

3.2.2.1 Evaluation of data quality.

3.2.2.2 Review of records, such as control charts, calibration records, standard inventory, etc.

3.2.2.3 Coordination and/or performance of quality control investigations.

3.2.2.4 Development and implementation of quality control programs, including statistical procedures and techniques.

3.2.2.5 Writing, updating and/or approval of QA/QC manuals and SOPs.

3.2.2.6 Performance of system quality audits.

3.2.3 METALS SECTION SUPERVISOR

The Metals Section Supervisor is directly responsible for the operation of the Metals Group. The Metals Section Supervisor is responsible for overall workload scheduling, staffing and capital expenditures. He/she signs all laboratory reports of the Group and assigns quality control activities.

3.2.4 ORGANICS SECTION SUPERVISORS

Different supervisors are directly responsible for the operation of the Gas Chromatography, HPLC and Industrial Hygiene GC/MS Groups. The supervisors are responsible for overall workload scheduling, staffing and capital expenditures of their groups. They sign all laboratory reports of the group and assign quality control activities.

3.2.5 ASBESTOS SECTION SUPERVISOR

The Asbestos Section Supervisor is directly responsible for the analysis of air and bulk samples by phase contrast and polarized light microscopy. The supervisor is responsible for overall workload scheduling, staffing and capital expenditures. He/she signs all laboratory reports of the department and assigns quality control activities.

3.2.6 WET CHEMISTRY SECTION SUPERVISOR

The Wet Chemistry Section Supervisor is responsible for the analysis of air and bulk samples for gravimetrics, silica, inorganic acids, and for all analytic techniques not involving metals, asbestos, or organics. The supervisor is responsible for overall workload scheduling, staffing and capital expenditures. He/she signs all laboratory reports of the department and assigns quality control activities.

3.2.7 ANALYSTS

3.2.7.1 Sample analysis.

3.2.7.2 Analysis of QC samples on a schedule determined by QC Manager and Section Supervisors.

3.2.7.3 Enter of QC data into laboratory notebooks.

3.2.8 SIGN-IN/SAMPLE CUSTODIAN

Responsible for sample receipt and custody.

3.2.8.1 Receives and logs in samples onto computer system and handwritten sign-in sheet.

3.2.8.2 Labels each sample with a unique number.

3.3.3 DEMONSTRATION OF PROFICIENCY

3.3.3.1 INITIAL DEMONSTRATION OF PROFICIENCY

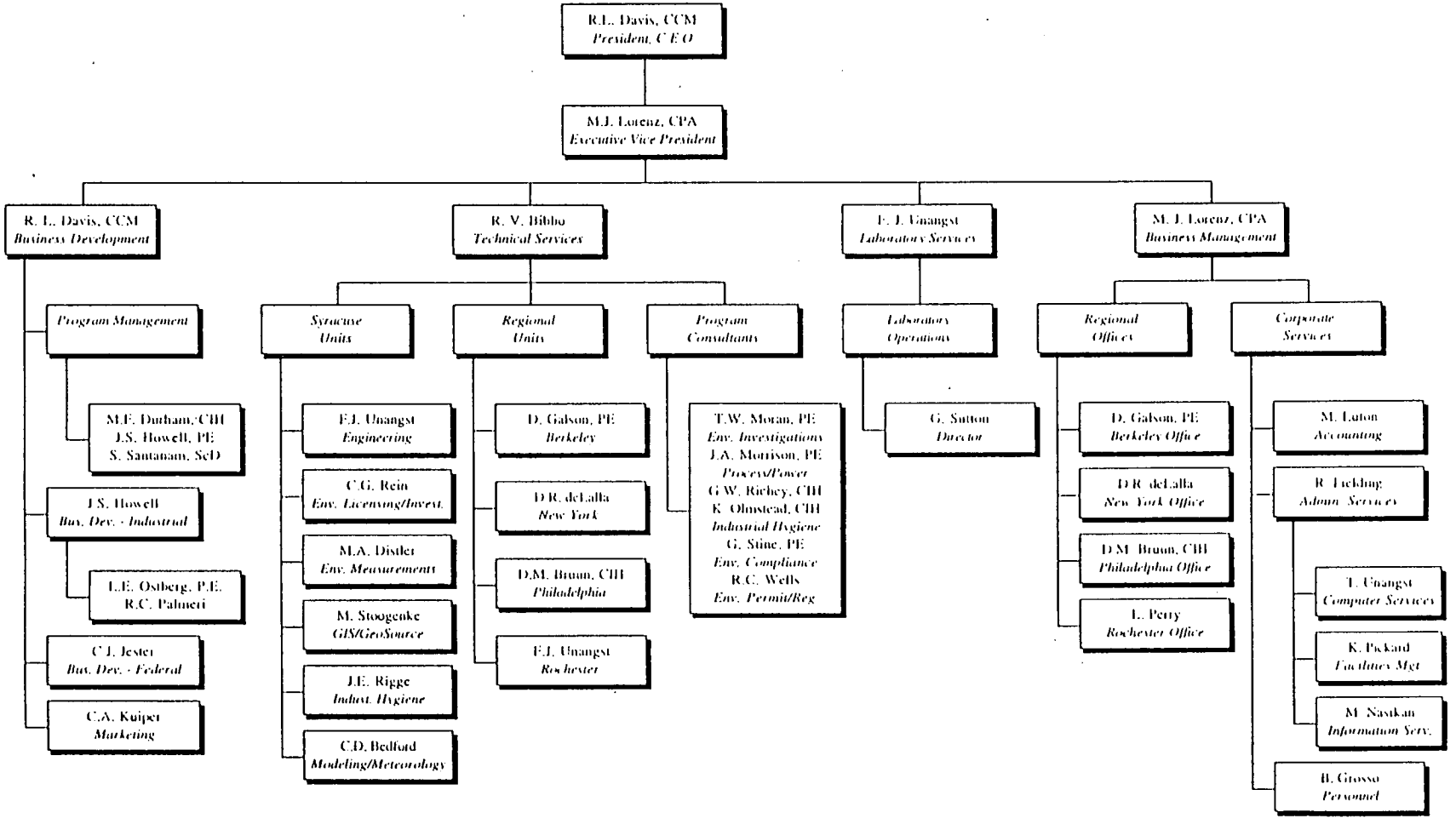
Before being allowed to analyze client samples, a new analyst must demonstrate proficiency by correctly analyzing spiked samples of known composition and concentration.

3.3.3.2 CONTINUING DEMONSTRATION OF PROFICIENCY

Reanalysis of samples and analysis of interlaboratory QC rounds are used to assure that analysts maintain their proficiency while performing routine sample analysis. Details of this QC program are found in Section 7.2.

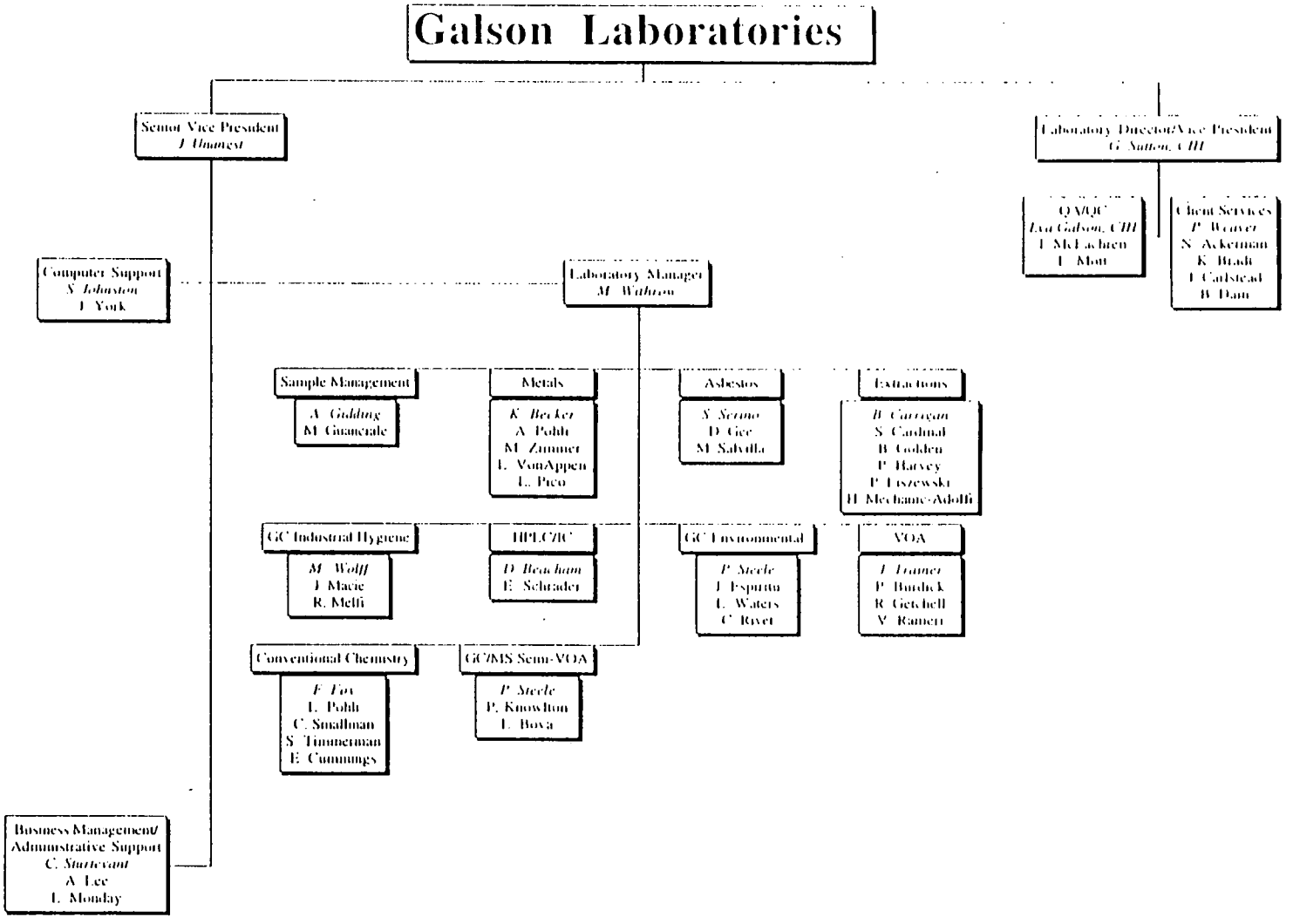
3.3.3.3 PROFESSIONAL DEVELOPMENT

Galson Laboratories encourages professional development of the industrial hygiene analytical staff by underwriting participation in AIHA activities on both the local and national levels. Analysts are also encouraged to seek certification by the American Board of Industrial Hygiene (ABIH).



Galson Corporation Organizational Chart

Galson Laboratories



Note: Names in *Italics* represent Section Supervisors

4.0 GENERAL LABORATORY CONDITIONS

A floor plan of the laboratory is found in Figures 4.1a and b, and Figure 4.1c is a floor plan of the total Galson Corporation facility. Environmental conditions in a laboratory have direct bearing on data generated. Lighting, ventilation, electrical power source, reagent water quality and temperature and humidity must be monitored.

4.1 LIGHTING

Adequate levels of illumination, light quality and freedom from glare are necessary for reading glassware gradations, identifying titration endpoints and reading instrument meters. Visual comfort is also an asset in maintaining personnel efficiency.

Lighting to meet these goals is provided. General illumination in laboratory spaces is provided by recessed three lamp fluorescent lights using light white and 34 watt energy saving bulbs. General illumination of at least 70 foot candles is provided.

At desk areas or areas where close or detailed work is done, the fluorescent lights are supplemented by other light sources, as needed.

4.3 ELECTRICAL CAPACITIES

Electrical capacities are provided to meet the needs of all specialized laboratory instruments. Specified surge elimination or electrical isolation is provided in critical areas. Emergency lighting is also provided in critical areas of the laboratory.

4.4 REAGENT WATER

Deionized water of reagent quality is provided by a commercial system, consisting of:

1 Prefilter
1 Carbon Tank
2 Mixed Bed Deionizers
1 10" 0.2 Micron Post Filter
2 Resistivity Lights (1 Mega-Ohm and 2 Kilo-Ohms)

The system has a capacity of 10 gal./min. The conductivity of the water produced is checked daily to meet specifications of <2 micromhos/CM.

The two resistivity lights provide warning that the tanks must be changed. Lights are on when the water quality is satisfactory. The first light is located between the two mixed bed deionizer tanks. When resistivity at that point falls below 200,000 ohms, the light goes out. The system supplier is called and provides a replacement tank within 24 hours. The second light at the delivery spigot goes out when resistivity at that point falls below 1X10 ohms.

Further water purification is provided for specialized analysis:

4.4.1 Organic Free Water - Organic free water is required for organic volatile analysis. Organic free water is obtained by passing the deionized water through a Millipore Milli Q system.

4.4.2 Ammonia Free Water - Ammonia free water is obtained, when needed, by storing deionized water with Dowex 50 W resin.

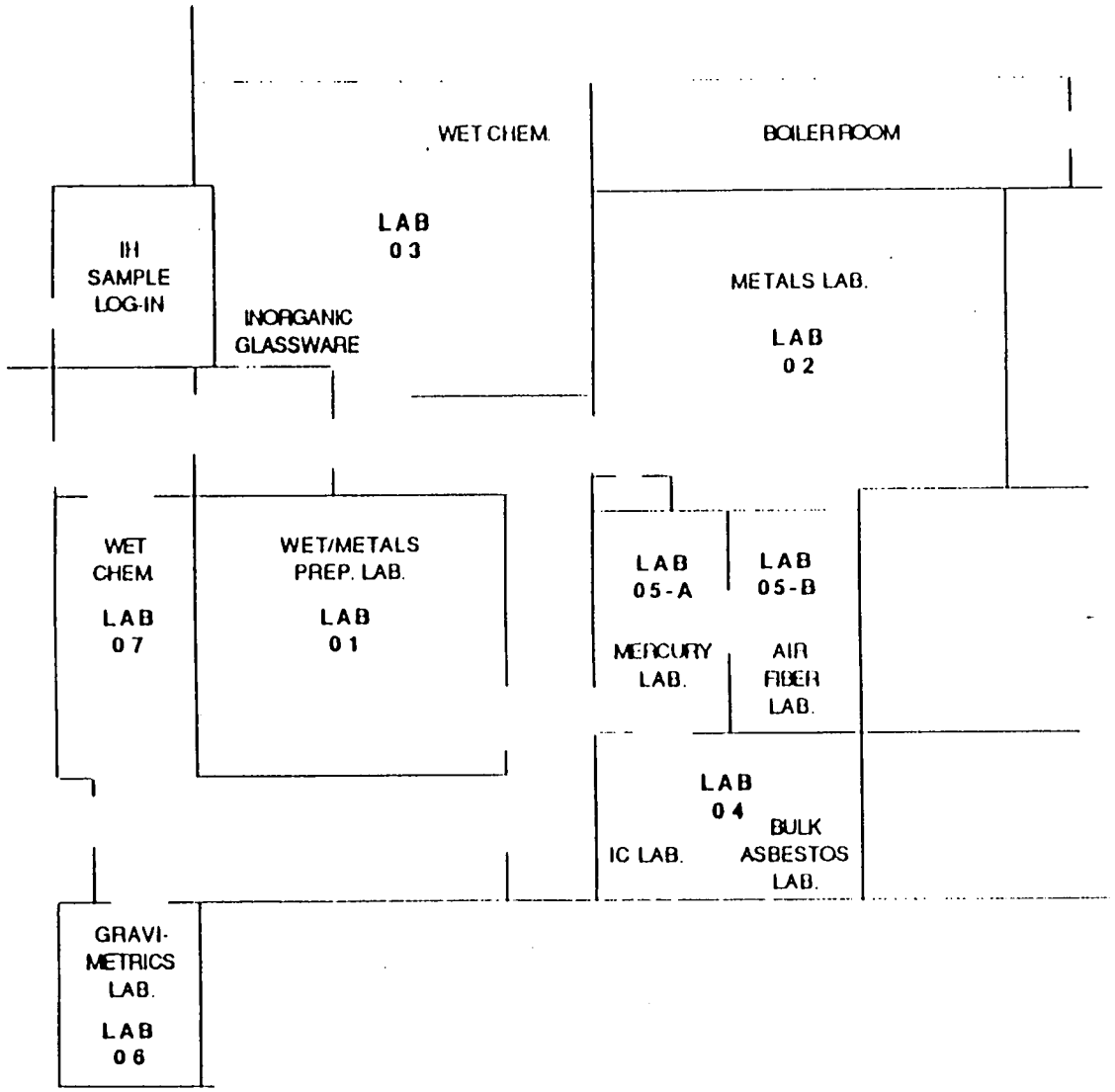
4.4.3 CO Free Water - CO free water is obtained, when needed, by boiling deionized water for fifteen minutes and cooling at room temperature.

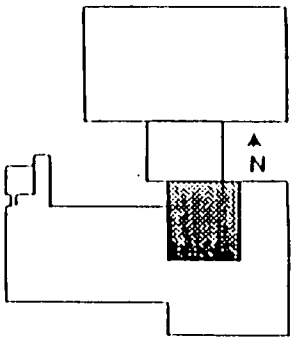
4.5 TEMPERATURE AND HUMIDITY

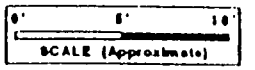
4.5.1 The temperatures of refrigerators, freezers, water baths, incubators and the walk-in coolers are measured daily and recorded. Adjustments are made if the temperature limits are exceeded.

4.5.2 The weigh room has a dedicated ventilation system and recorder, so that temperature and humidity can be closely controlled. This control minimizes fluctuations in the weight of air monitoring filters.

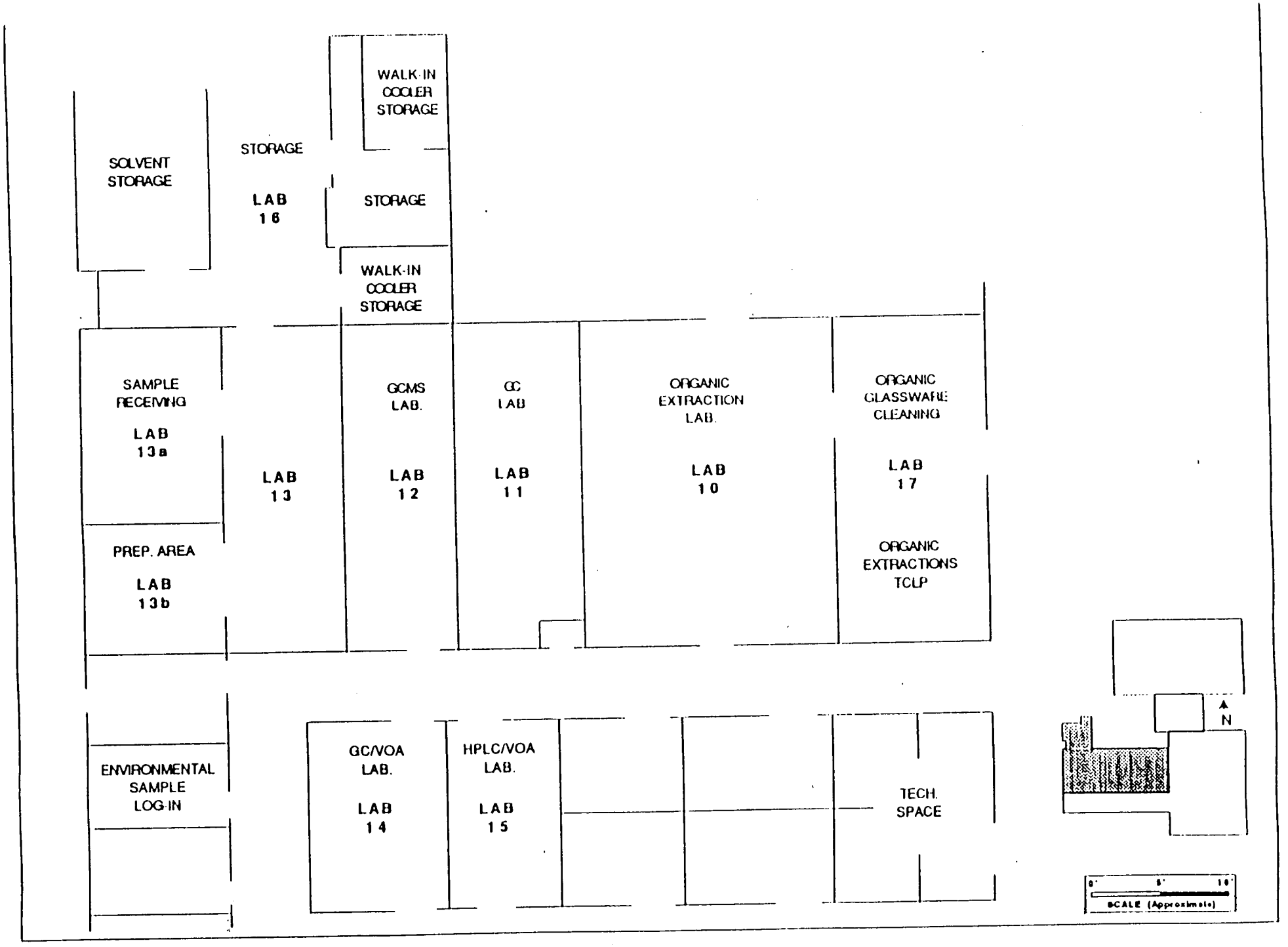
4.5.3 The asbestos bulk analysis laboratory temperature is monitored daily since the refractive indexes of dispersion oils change with temperature.



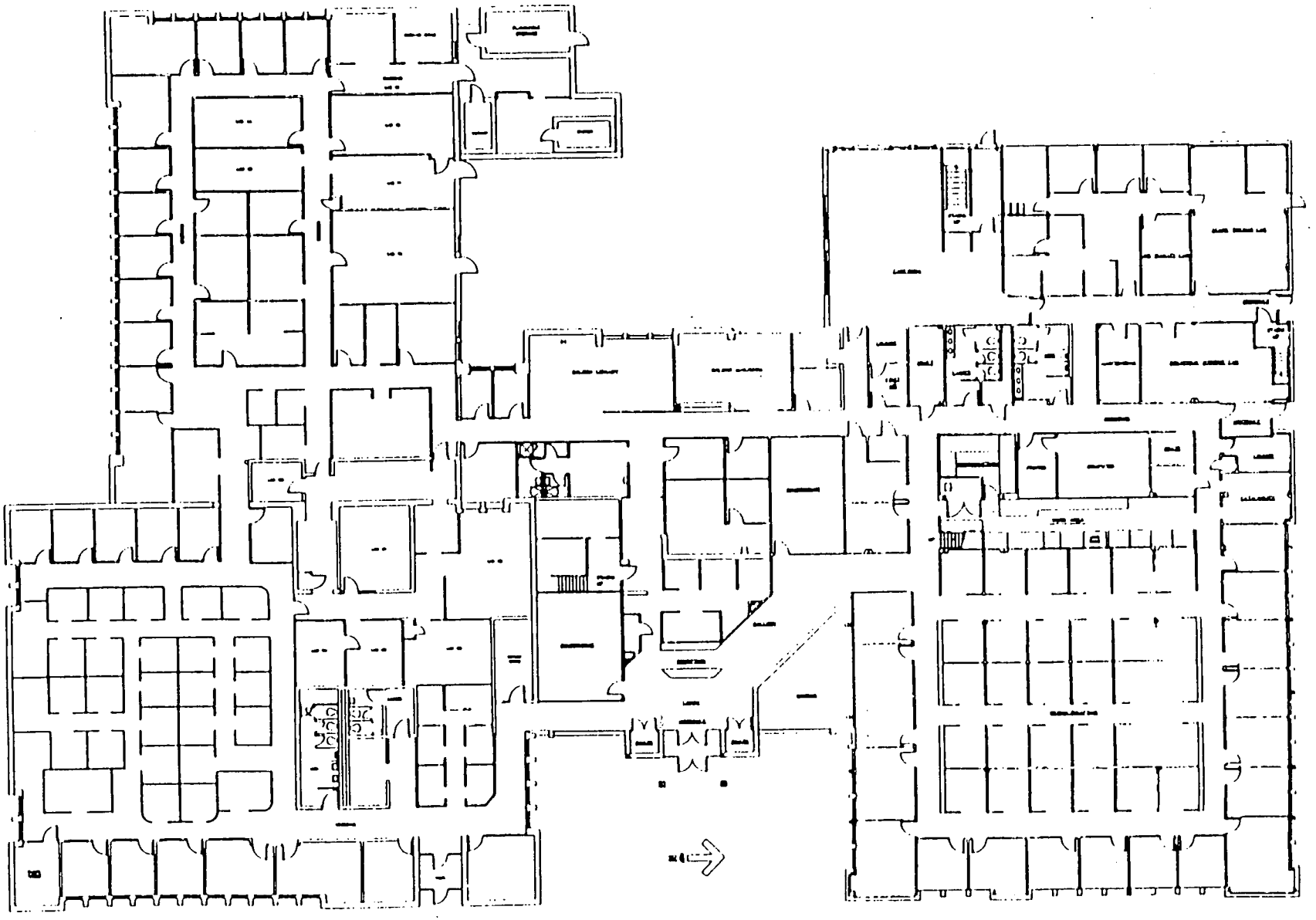




GALSON LABORATORIES LAYOUT PLAN



GALSON LABORATORIES LAYOUT PLAN



GALSON BUILDING PLAN

FIGURE 4.1c

LAB HOOD VELOCITY SCHEDULE

HOOD No.	EXHAUST FAN No.	HOOD LOCATION	DESIGN CFM	FACE FPM W	L	SQ FT	FACE FPM MAX	FACE FPM MIN	MEAS CFM MAX	MEAS CFM MIN	OPERATE
1	EF-15	not used									
2	EF-15	14		17	50	5.9	96		567		ON-OFF
3	EF-12	12		4	6.25	0.17	58		10		HI-LO-OFF
4	EF-12	11		14.5	16	1.6	70		113		HI-LO-OFF
5	EF-12	11		15.25	14.5	1.5	70		107		HI-LO-OFF
6	EF-12	11		7	8	0.38	73		28		HI-LO-OFF
7	EF-12	11		7	8	0.4	53		21		HI-LO-OFF
8	EF-11	11		10.25	9	0.6	52		33		VSC
9	EF-12	11		17	50	5.9	95		561		HI-LO-OFF
10	EF-12	12		8	8	0.45	120		53		HI-LO-OFF
11	EF-3	1	1000	29.5	40	8.19	96		787		HI-LO-OFF
12	EF-4	1		30.5	57	12	87		1050		HI-LO-OFF
13	EF-5	3		30	55.5	11.6	91		1052		HI-LO-OFF
14	EF-5	3			6	0.2	110		22		HI-LO-OFF
15	EF-5	3		11.5	47.13	3.8	82		327		ON-OFF
16	EF-14	4		17	22	2.6	100		260		ON-OFF
17	EF-14	4		12	56.25	4.69	150		703		ON-OFF
18	EF-6	2		8	12	0.67	425		283		ON-OFF
19	EF-6	2		6	12	0.5	340		170		ON-OFF
20	EF-6	2		6	12	0.5	350		175		ON-OFF
21	EF-4	5		6	12	0.5	195		98		HI-LO-OFF
22	EF-7	not used									
23	EF-11	10		27.25	50.5	9.6	186		822		VSC
24	EF-8	not used									
25	EF-8	10		29.5	50.25	10.3	82		896		VSC
26	EF-10	10	1000	26.25	50.25	9.2	80		734		VSC
27	EF-7	10		27.13	50.5	9.5	88		837		VSC
28	EF-13	10	2000	28.4	86.25	17	104		1769		VSC
29	EF-16	13	2000	27.5	38.25	7.2	73		533		ON-OFF
30	EF-4	2		12	6	0.5	180		90		HI-LO-OFF
31	EF-15	15		8.25	5	0.29	255		73		ON-OFF
32	EF-15	15		8.25	5	0.29	235		67		ON-OFF
33	EF-15	15		16	14.5	1.6	83		134		HI-LO-OFF
34	EF-15	15		16	28	3.1	205		273		ON-OFF
35	EF-22	10	1500	52	27	9.75	[illegible]		731		ON-OFF
36	EF-21	17	1100	62.5	30.5	13.24	84		1112		VSC
37	EF-20	17	1100	62.5	30.5	13.24	89		1178		VSC
38				11.5	34.5	2.75	17		47		ON-OFF
39	EF-14			19.25	31.5	4.21	44		185		ON-OFF
2,31,32,33,34	EF-15		1000						1114		ON-OFF
3,4,5,6,7,9,10	EF-12		1000						893		HI-LO-OFF
8,23	EF-11		1000						855		VSC
12,21,30	EF-4		1150						1238		HI-LO-OFF
13,14,15	EF-5		1400						1401		HI-LO-OFF
16,17,39	EF-14		1400						1148		ON-OFF
18,19,20	EF-6		800						628		ON-OFF
22,27	EF-7		1000						837		VSC
24,25	EF-8		1000						896		VSC
TOTAL CFM			19450						15901		

5.0 INSTRUMENT CALIBRATION AND MAINTENANCE

A history file is maintained by the Laboratory Accountant or a designee for each piece of equipment and associated apparatus. The history file contains a chronological record of each device from the time of purchase to the time of retirement or loss. The history file includes, where applicable, the following:

- Procurement Documents
- Galson Assigned Identification Number
- Item Description
- Manufacturer's Serial Number
- Evidence of Acceptance
- Supplier Certificates (Conformance, Calibration, Traceability)
- Service, Maintenance and Repair Reports

An individual instrument log is maintained for each instrument in the laboratory in which routine maintenance and major service calls are recorded.

Table 5.1 is the Galson Laboratories Major Instrument List. Calibration and maintenance are described for only those instruments involved in industrial hygiene analysis.

5.1 ANALYTICAL BALANCES

5.1.1 METTLER AND AINSWORTH SIDE LOADING BALANCES

5.1.1.1 DAILY CALIBRATION

Balances are checked with two Type S weights daily.

5.1.1.2 Annual servicing and calibration balances are maintained on a service contract. This contract includes annual servicing and calibration by a Mettler engineer. A calibration status label is affixed to each balance after calibration.

5.1.2 CAHN MICROBALANCES

5.1.2.1 DAILY CALIBRATION

Balances are calibrated with each use according to manufacturer's directions.

5.1.2.2 ANNUAL SERVICING AND CALIBRATION

Balances are sent to a qualified service representative for servicing and calibration.

5.2 SPECTROPHOTOMETERS

Types and Applications: A Bausch and Lomb Spectronic 1001 is the analytical spectrophotometer to be used in every possible colorimetric analysis. The Perkin-Elmer 467 Grating Infrared Spectrophotometer is used for all IR applications, such as oil mist and silica analysis. The spectrophotometers are located in an analytical room separate from corrosives and dust.

5.2.1 INFRARED SPECTROPHOTOMETER

5.2.1.1 DAILY CALIBRATION

The proper GAIN control setting is determined.

5.2.1.2 The zero control setting is adjusted with each use.

5.2.1.3 The GAIN calibration is checked.

5.2.1.4 QUARTERLY CALIBRATION

A polystyrene film is scanned and the test spectrum is compared to the reference spectrum. The spectra should be comparable within the limits of the instrument specifications with respect to wave number accuracy, resolution, stray light and noise.

5.2.2 UV/VISIBLE SPECTROPHOTOMETER

5.2.2.1 CALIBRATION WITH EACH USE

Blanks and a complete calibration curve are run with each set of analyses.

5.2.2.2 QUARTERLY CALIBRATION

Wavelength alignment is checked with a dilute solution of potassium permanganate. This solution gives maximum absorption at 526 and 546 nm.

5.2.2.3 All absorption cells must be kept scrupulously clean, free of scratches, fingerprints, smudges and evaporated film residues.

5.2.2.4 ANNUAL SERVICE AND CLEANING

Service and cleaning are performed by a service technician, as needed.

5.3 ATOMIC ABSORPTION SPECTROPHOTOMETERS

5.3.1 LEEMAN PS200

This instrument is used for analysis of samples for mercury.

5.3.1.1 WITH EACH USE CALIBRATION

Calibration is performed with each use by running a blank and a multipoint calibration curve.

5.3.1.2 Aperture is checked daily and adjusted if necessary.

5.3.1.3 AS-NEEDED MAINTENANCE

Drying tube is changed daily.

5.3.1.5 SERVICE AND REPAIR

Service is performed, when needed, by manufacturer trained personnel.

5.3.2 PERKIN-ELMER 5100

This instrument is equipped with a Zeeman 5100 graphite furnace and is used for arsenic and selenium analysis and for other metals when low detection limits are required.

5.3.3 PERKIN-ELMER 4000

This instrument is set up with a HGA-500 graphite furnce and is used as a backup to the Perkin-Elmer 5100 for low concentration I.H. metals analyses.

CALIBRATION FOR PE 5100 AND PE 4000

5.3.3.1 WITH EACH USE CALIBRATION

Calibration is performed using a single calibration standard. The calibration is checked with a quality control sample from a separate source.

5.3.3.2 Quartz windows are cleaned daily.

5.3.3.3 AS-NEEDED MAINTENANCE

Contact cylinders are checked daily and changed, when needed. Graphite tubes are inspected frequently and changed, when needed.

5.3.3.4 SERVICE AND REPAIR

Repair and service are performed, when needed, by manufacturer trained personnel.

5.4 INDUCTIVELY COUPLED PLASMA SPECTROMETERS

The Leeman Labs Plasma-Spec instrument is used for all I.H. metal analyses not requiring a graphite furnace or flameless atomic absorption.

The Leeman PS 2000 Inductively Coupled Plasma Spectrometer, which is mainly used for environmental analyses, can be used as a backup for I.H. metals.

5.4.1 WITH EACH USE CALIBRATION

Every time the instrument is turned on, it is peaked with a nickel peaking standard. The instrument is calibrated with a blank and one standard. The calibration is checked with a QC sample from a separate source.

5.4.2 QUARTERLY CALIBRATION

An interelement correction standard is run quarterly.

5.4.3 SERVICE AND REPAIR

The instrument is under a service contract and is serviced by manufacturer trained personnel.

5.5 GAS CHROMATOGRAPHIC SYSTEMS

Galson Laboratories has twelve gas chromatographic systems, with a variety of detectors and inlet systems. The following four instruments are routinely used for industrial hygiene analysis:

Hewlett-Packard 5880, with autosampler, gas sampling valve, Electron Capture (ECD), Nitrogen/Phosphorus (NPD) and Flame Ionization (FID) Detectors.

Hewlett-Packard 5890 with autosampler FID and PID detectors.

Hewlett-Packard 5890 with autosampler, NPD and FID.

Hewlett-Packard 5890 with two columns, autosamplers and FID detectors to run two sets of samples at the same time under the same set of conditions.

Hewlett-Packard 5890A with a 5971 Mass Selective Detector and Tekmar thermal desorption unit. Data collection and analysis are accomplished using a PC chemstation.

5.5.1 WITH EACH USE CALIBRATION OF CHROMATOGRAPHIC SYSTEMS

Blanks and a multipoint calibration curve are run.

5.5.2 WEEKLY MAINTENANCE

5.5.2.1 The septum is changed once weekly or every 100 injections.

5.5.2.2 Injection port liner is changed.

5.5.2.3 The column is clipped.

5.5.3 AS-NEEDED DETECTOR MAINTENANCE

5.5.3.1 FLAME IONIZATION DETECTORS

Detector cleaning.

5.5.3.2 NITROGEN-PHOSPHOROUS DETECTORS

Collector replacement.

5.5.3.3 PHOTOIONIZATION DETECTORS

The lamp window is cleaned. The lamp is replaced, if necessary.

5.5.3.4 ELECTRON CAPTURE DETECTORS

The detector background level is checked with each use. The detector is returned to Hewlett-Packard if background level remains unacceptably high.

A detector wipe test is performed every six (6) months. The wipe samples are sent to Hewlett-Packard for analysis.

5.5.3.5 ELECTROLYTIC CONDUCTIVITY DETECTOR

The transfer line is rinsed, as needed. Reactor tube is replaced, as needed.

5.5.4 ANNUAL SERVICE AND MAINTENANCE

All gas chromatographs are under a service contract. Service is performed by Hewlett-Packard, as needed. Routine maintenance is performed on a schedule specified by the service contract, at least annually.

5.6 HIGH PERFORMANCE LIQUID CHROMATOGRAPH

The high performance liquid chromatographs (HPLC) are a Shimadzu Dual System LC-6A and a Hewlett Packard 1050. The first system is composed of an auto injector, system controller, source, UV-VIS detector, fluorescence detector, dual pumps and dual computing integrators. The system can be operated manually, with one pump, or with one integrator. This capacity eliminates downtime associated with those components. The HP 1050 has similar capabilities, but has a single pump with two pistons.

5.6.1 CALIBRATION WITH EACH USE

Blanks and a multipoint calibration curve are run.

5.6.2 AS-NEEDED MAINTENANCE

5.6.2.1 The injector septum is changed when retention time shifting is noted.

5.6.2.2 The guard column is repacked when pressure increases above the column limit.

5.6.3 SERVICE AND REPAIR

Service and repairs that cannot be performed by the Galson laboratory staff are performed by a Shimadzu trained technician. The HP 1050 is under a service contract.

5.7 ION CHROMATOGRAPH

The ion chromatograph is a Dionex Model 2000 inert dual pump instrument.

5.7.1 CALIBRATION WITH EACH USE

5.7.1.1 Blanks and a multipoint calibration curve are run.

5.7.1.2 Valves and lines are inspected for leaks.

5.7.2 AS-NEEDED MAINTENANCE

The need for maintenance is indicated when the back pressure increases above specified limits or peak shape and resolution are poor.

5.7.2.1 The column support bed is changed.

5.7.2.2 The column is cleaned by reversing the direction of flow and passing a 1% sodium carbonate solution through the column.

5.7.3 SERVICE AND REPAIR

Repairs that cannot be performed by the Galson Laboratories staff are performed by a Dionex trained technician.

5.8 MICROSCOPES

Galson Laboratories has five Nikon Labophot-POL microscopes equipped for analysis of air samples by phase contact microscopy and bulk samples by polarized light microscopy. Details of calibration and maintenance are found in the Galson Laboratories Asbestos Quality Assurance Manual.

Major Analytical Instruments

Reference Number	Instrument	Manufacturer	Model
MS-A	GC/MS MSD	Hewlett-Packard	5890/5970
	GC/MS Dynamic Headspace Concentrator with Automated Sampler Module	Tekmar	4000/ALS
MS-B	GC/MS MSD	Hewlett-Packard	5890/5970
	GC/MS Purge and Trap Concentrator with Autosampler and Heater	Tekmar	3000/2016/ASH
MS-C	GC/MS MSD	Hewlett-Packard	5890/5970
	GC/MS Purge and Trap Concentrator with Autosampler	Tekmar	3000/2016
MS-D	GC/MS MSD	Hewlett-Packard	5890/5970
	GC/MS Autosampler	Hewlett-Packard	7673
MS-E	GC/MS	Hewlett-Packard	5890/5971
	GC/MS Autosampler	Hewlett-Packard	7673
	GC/MS Data System with Aquarious Software and NBS Library (E Series)	Hewlett-Packard	HP-1000 RTE/6
	GC/MS Data System with Aquarious Software and NBS Library (A Series)	Hewlett-Packard	HP-1000 RTE-A
	GC/MS Thermal Desorption Unit For Multimedia Tubes	Tekmar	5010
	Track Magnetic (2) Tape Drive	Hewlett-Packard	7974

Reference Number	Instrument	Manufacturer	Model
Hp#1	Gas Chromatograph 2 FID, 1 ECD, 1 NPD	Hewlett-Packard	5880
	GC Autosampler	Hewlett-Packard	7673
Hp#2	Gas Chromatograph 1 FID, 1 ECD	Hewlett-Packard	5880
	GC Autosampler	Hewlett-Packard	7673
Hp#3	Gas Chromatograph 1 FID, 1 PID	Hewlett-Packard	5890
	GC Autosampler	Hewlett-Packard	7673
Hp#4	Gas Chromatograph 1PID, 1ELCD	Hewlett-Packard	5890
	GC Liquid Sample Concentrator Automated Sampler Module	Tekmar	LSC-2/ALS
Hp#5	Gas Chromatograph 1 FID, 1NPD	Hewlett-Packard	5890A
	GC Autosampler	Hewlett-Packard	7673
Hp#6/CH11	Gas Chromatograph 2FID	Hewlett-Packard	5890
	Dual GC Autosampler	Hewlett-Packard	7673
Hp#7	Gas Chromatograph 1 ECD, NPD	Hewlett-Packard	5890
	GC Autosampler	Hewlett-Packard	7673

Reference Number	Instrument	Manufacturer	Model
Hp#8	Gas Chromatograph 1 PID, 1 ELCD	Hewlett-Packard	5890
	GC Sample Concentrator with Automated Heated Sampler Module	O.I. Analytical	4460A/MPM-16/MHC-16
Hp#9	Gas Chromatograph 2 ECD	Hewlett-Packard	5890
	Dual GC Autosampler	Hewlett-Packard	7673
Hp#10	Gas Chromatograph 2 ECD	Hewlett-Packard	5890A Series II
	Dual GC Autosampler	Hewlett-Packard	7673
Hp#12	Gas Chromatograph 1 FID, 2 NPD	Hewlett-Packard	5890A Series II
	Dual GC Autosampler	Hewlett-Packard	7673
Hp#13	Gas Chromatograph 2 ECD	Hewlett-Packard	5890A Series II
	Dual GC Autosampler	Hewlett-Packard	7673
	GC Data System	Hewlett-Packard	3350
LC-1	HPLC with Autosampler UV/VIS and Fluorescence Detection	Shimadzu	LC-6A
LC-2	HPLC with Autosampler UV and Fluorescence Detection	Hewlett-Packard	1050
LC-3	HPLC with Autosampler UV Detection	Hewlett-Packard	1090
	Ion Chromatograph with Conductivity Detection, Chemical Suppression and Autosampler	Dionex	2001 i

Reference Number	Instrument	Manufacturer	Model
	Gel Permeation Chromatograph Automated Prep	ABC	1002B
ICP1	Inductively Coupled Plasma Emission Spectrometer	Leeman	Plasma Spec 1
ICP2	Inductively Coupled Plasma Emission Spectrometer	Leeman	PS2000
ICP3	Trace Inductively Coupled Plasma Emission Spectrometer	Thermo-Jerrel Ash	ICAP 61E Trace
F1	Atomic Absorption Spectrometer with Graphite Furnace and Autosampler	Perkin-Elmer	4000, AS-40
HG1	Mercury Analyzer with Autosampler	Leeman	PS200
	Microwave Digestion System(2)	CEM	MDS 81D MDS 81
	Autoanalyzer with Cyanide, Ammonia and Phenol Modules	Technicon	AA II
	Ion Chromatograph with Conductivity Detection, Chemical Suppression and Autosampler	Dionex	2001 i
	Spectrophotometer (UV/VIS)	Bausch & Lomb	Spec 1001
	Spectrophotometer (FTIR)	Perkin-Elmer	1600
	Automatic Cyanide Preparation System	Leeman	AP 1214
	Analytical Balances	Mettler	AK 160 PJ 400 AE 50 AB 104
	Analytical Balance	Sartorius	PT 600

6.0 ANALYTICAL PROCEDURES

For industrial hygiene analysis, Galson Laboratories routinely uses methods found in:

NIOSH Manual of Analytical Methods
2nd and 3rd Editions
OSHA Analytical Methods Manual

For non-routine analysis, methods used include:

Private communications from OSHA or NIOSH
Client developed analytical methods
Methods found in the American Industrial Hygiene Association Journal.

6.1 APPROVAL OF METHODS

All I.H. methods used in the laboratory are approved by the Laboratory Director and/or the QA Manager. All changes in methods are approved by them and are dated and initialed. Copies of obsolete methods are retained in the laboratory under the supervision of the QA Manager.

6.2 AVAILABILITY OF METHODS

Copies of all methods are found in the laboratory, accessible to the analysts.

6.3 STANDARD OPERATING PROCEDURES (SOPs)

Galson Laboratories maintains Standard Operating Procedures (SOPs) for all laboratory procedures and analytical methods. A compilation of all SOPs is kept by the QC group both in hard copy and on the computer. Each group has copies of directly applicable SOPs in its area.

The SOPs for each analytical method contains detailed information on:

- Purpose
- Responsibilities
- Definitions
- Materials and Reagents
- Safety and Operating Precautions
- Standard Preparation
- Sample Preparation
- Calculations
- Quality Control
- LIMS or Other Computer Programs in Use

7.0 ANALYTICAL QUALITY CONTROL

Internal Quality Control (QC) checks are used to assess the accuracy and precision of analytical results. Accuracy assessment is performed by analyzing samples containing a known quantity of material of interest. The samples may be established knowns from an outside source, such as PAT samples or EPA ampules or a spiked sample produced in-house.

Precision assessment is performed by duplicate or triplicate analysis of the same sample. The sample may be a real world sample or an accuracy QC sample.
The following QC procedures are used for routine analyses:

7.1 INTRALABORATORY QUALITY CONTROL

7.1.1 BLANKS

Blanks and a multilevel concentration curve are run with each set of analyses.

7.1.2 DUPLICATES

5 to 10% of all analyses are performed in duplicate. For sorbent tubes, monitors or air filters for metals, the sample eluent or filter digest is injected in duplicate. Records of duplicate results are kept, CVs are calculated and corrective action is taken if CVs are outside specified limits.

7.1.3 SPIKED SAMPLES

A spiked blank is run with every set of organic analyses and ion chromatography analyses. A spiked metal filter blank is run every twenty samples. Records of spiked blank recoveries are kept and are plotted on control charts. Figure 7.1 is an example of a control chart. Recoveries outside control limits are investigated. Corrective action is taken and documented.

7.1.4 QC CHECK SAMPLES

Analysis of a known QC check samples is performed after the tenth metal sample and every twentieth ion chromatography sample. Records of QC sample recoveries are tabulated. Recoveries outside control limits are investigated and corrective action is taken.

7.2 INTERLABORATORY QUALITY CONTROL AND LABORATORY CERTIFICATIONS

7.2.1 PAT SAMPLES

Galson Laboratories participates in the American Industrial Hygiene Association's (AIHA) Proficiency Analytical Testing (PAT) Program. Four samples for organic solvents, metals, silica and asbestos are analyzed quarterly. Results must fall within three standard deviations of the mean of all non-outlier results submitted.

7.2.2 AIHA LABORATORY ACCREDITATION

Galson Laboratories is fully accredited by the AIHA. In addition to participation in the PAT Program, the laboratory must meet stringent requirements covering staff, facilities, QC, reporting, document control and analytic methodology, and pass site visits every three years.

7.2.3 NEW YORK STATE DEPARTMENT OF HEALTH (NYS DOL) QC ROUNDS

Galson Laboratories receives semi-annual QC samples for air, as well as asbestos air and bulk samples and emission analyses. Results must fall within three standard deviations of all the results submitted.

7.2.4 NYS DOL ENVIRONMENTAL LABORATORY APPROVAL PROGRAM (ELAP)

Galson Laboratories is approved by the NYS DOL ELAP Program. In addition to air, emission and asbestos analysis, we are approved for potable and non-potable water chemistry and bacteriology and for solid and hazardous waste analysis. In addition to analysis of QC samples, the laboratory must pass annual inspections covering all phases of laboratory operations.

7.2.5 INTERLABORATORY ROUND-ROBIN

Solvent and metal I.H. samples are sent to four other laboratories quarterly by Galson Laboratories.

7.2.6 INTERLABORATORY ASBESTOS QUALITY CONTROL

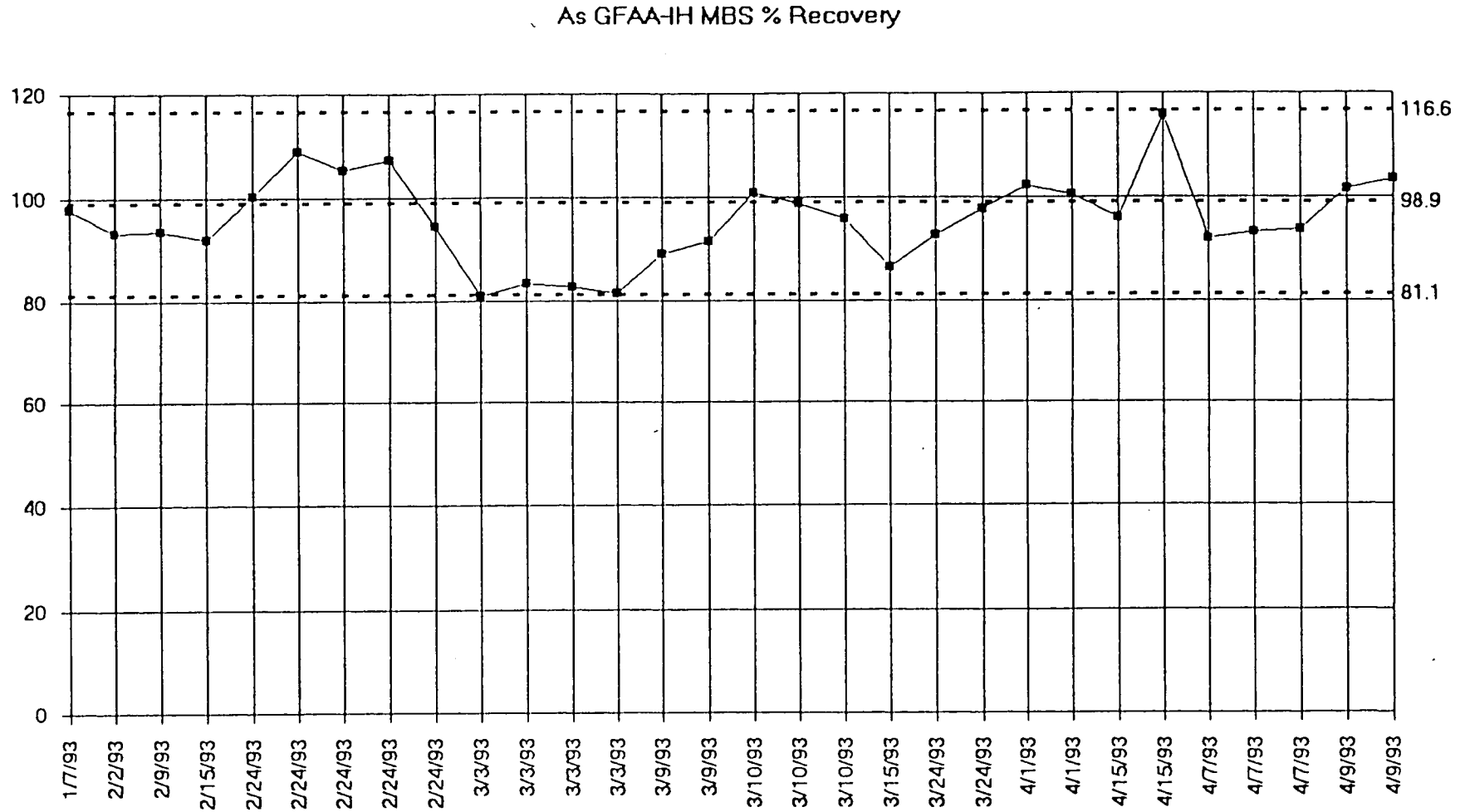
Asbestos QC is detailed in the separate Asbestos Analysis Quality Assurance Manual. Below is a summary of Interlaboratory Asbestos QC:

7.2.6.1 NVLAP NIST Program

7.2.6.2 NYS ELAP Program

7.2.6.3 Galson Interlaboratory Round-Robin

7.2.6.4 Two other Interlaboratory Round-Robins, each with at least three other laboratories


As GFAA-IH MBS % Recovery
120
100
80
60
40
20
0
116.6
98.9
81.1
1/7/93
2/2/93
2/9/93
2/15/93
2/24/93
2/24/93
2/24/93
2/24/93
2/24/93
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4/15/93
4/7/93
4/7/93
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4/9/93

Figure 7-1

8.0 PERFORMANCE AND SYSTEM AUDITS

8.1 PERFORMANCE AUDITS

Weekly performance audits are conducted on the gas chromatographs to determine column and system performance. A mixture of compounds is injected which evaluates the resolution of closely eluting compounds and tendency of the column to degrade or absorb labile compounds. The background reading of EC Detectors is monitored daily.

Annual interelement correction standards are run on the Inductively Coupled Plasma Spectrometer to track changes in element interferences.

For other analyses, the calibration procedure of instruments that give a linear response is used to track changes in performance. Data produced during audits are retained in the laboratory for historical purposes.

8.2 SYSTEM AUDITS

Internal system audits of all laboratory functions are conducted by the Laboratory QA Manager. The audit documents whether written procedures are being followed.

The system audits are conducted to evaluate the following:

- Sample Handling and Chain of Custody Procedures
- Calibration Procedures
- Analytical Procedures
- QC Results
- Safety Procedures
- Training Documentation
- Record Keeping Procedures

Written audit reports are submitted to the audited group and to laboratory and Galson Corporation management. The audit reports list items needing correction or improvement and specifies a time for response and a corrective action schedule.

9.0 CORRECTIVE ACTION

Galson uses the immediate closed loop corrective action system. This method can be applied equally to non-conforming data, malfunctioning equipment, discovery of contamination or client complaints. The following actions are taken, as appropriate, to remedy an out-of-control situation:

9.1 Define problem.

9.2 Investigate and determine cause of problem.

9.3 Determine corrective action to eliminate problem.

9.4 Implement corrective action.

9.5 Verify corrective action has eliminated problem.

9.6 Implement procedures to eliminate problem in the future.